CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD
8800 Cal Center Drive
Sacramento, CA 95826
(916) 255-2200

Wednesday, July 17, 1996
9:30 a.m.

meeting of the

LOCAL ASSISTANCE AND PLANNING COMMITTEE

Wesley Chesbro, Chairman
Robert C. Frazee, Member
Janet Gotch, Member

AGENDA

Note:
- *o Agenda items may be taken out of order.*
- *o If written comments are submitted, please provide 15 two-sided copies.*
- *o Unless otherwise indicated, Committee meetings will be held in the CIWMB Hearing Room, 8800 Cal Center Drive, Sacramento, CA.*

Important Notice: The Board intends that Committee Meetings will constitute the time and place where the major discussion and deliberation of a listed matter will be initiated. After consideration by the Committee, matters requiring Board action will be placed on an upcoming Board Meeting Agenda. Discussion of matters on Board Meeting Agendas may be limited if the matters are placed on the Board's Consent Agenda by the Committee. Persons interested in commenting on an item being considered by a Board Committee or the full Board are advised to make comments at the Committee meeting where the matter is considered.

Some of the items listed below may be removed from the agenda prior to the Committee meeting. To verify whether an item will be heard, please call Kathy Marsh, Committee Secretary, at (916) 255-2172.

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23. OPEN DISCUSSION

24. ADJOURNMENT

Notice: The Committee may hold a closed session to discuss the appointment or employment of public employees and litigation under authority of Government Code Sections 11126 (a) and (q), respectively.

For further information contact:
INTEGRATED WASTE MANAGEMENT BOARD
8800 Cal Center Drive
Sacramento, CA 95826

Patti Bertram
(916) 255-2156

NOTE: BOARD AND COMMITTEE AGENDAS ARE AVAILABLE ON THE INTERNET. THE CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD'S HOME PAGE IS AS FOLLOWS: HTTP://WWW.CIWMB.CA.GOV/

LOCAL PLANNING DOCUMENTS

In consideration of the in-house waste prevention policy, the July 17, 1996 Local Assistance and Planning Committee Agenda Items 5, 7 through 16, 18, 19, and 21 will not be included in the July 30, 1996 Board Meeting packet.

Please retain the above items for inclusion in the July 30, 1996 Board packet.

If you have any questions or need to obtain additional copies of the above items, please contact Patti Bertram, the Board's Administrative Assistant, (916) 255-2156.

CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD

Local Assistance and Planning Committee Meeting
July 17, 1996

AGENDA ITEM 22

ITEM: CONSIDERATION OF THE 1995 RIGID PLASTIC PACKAGING CONTAINER (RPPC) ALL-CONTAINER AND PETE RECYCLING RATES

I. SUMMARY

Senate Bill 235 (Public Resources Code §42310) required the Board in 1993 and annually thereafter to adopt methods to calculate two recycling rates: an aggregate recycling rate (all-container rate) for all rigid plastic packaging containers (RPPCs) sold in California and a recycling rate for polyethylene terephthalate (PETE) RPPCs sold in the State.

Under PRC §42310, product manufacturers have five options to comply with the California RPPC Program. Product manufacturers can use the PETE recycling rate option to show compliance if the PETE rate is 55% or greater or use the all-container rate option if the all-container rate is 25% or greater.

To receive wide review and input, the Board established a Recycling Rate Advisory Committee (RRAC) comprised of representatives from the product manufacturers regulated by the Program, the American Plastics Council, environmental and waste management organizations, and plastics recyclers and reclaimers. The RRAC reviewed work in progress and advised staff on plastic recycling issues as the all-container recycling rate was being developed and determined.

At its June 1995 meeting, the Board approved a methodology for calculating the PETE rate, and, at its July 1995 meeting directed staff to work jointly with the American Plastics Council (APC) to calculate the 1995 all-container recycling rate.

Also at its July 1995 meeting, the Board also directed staff to use national resin sales production data to calculate the tons of plastic containers generated in California during 1995. This was to be done independently of the Cascadia study. Using an approach developed by the staff in early 1994 and discussed at a public workshop on March 31, 1994, staff calculated the 1995 all-container generation using national resin sales statistics. The analysis is shown in the Analysis Section of this Agenda Item and detailed in Attachment 4.

The results of the PETE recycling rate analysis and the Cascadia all-container recycling rate study are summarized in the following Table:

1995 Recycling Rate Results

	Tons Recycled	Tons Generated	Recycling Rate
PETE	39,547	101,934	38.8%
All-Container (Cascadia)	78,200	310,400	25.2%

Since the PETE rate is less than 55% using the Board-approved methodology, the PETE Recycling Rate Compliance Option is not available to product manufacturers for 1995. However, since the all-container rate is greater than 25%, all product manufacturers will be found to be in compliance with the California RPPC Program in 1995 if the Board accepts the Cascadia study results.

II. PREVIOUS COMMITTEE ACTION

The Local Assistance and Planning Committee was briefed on the progress of the all-container study at its June 1996 meeting. The Committee had also been briefed by the APC consultant regarding the work completed, work underway and planned, and methodologies to be followed at its September 1995 and January 1996 meetings.

III. OPTIONS FOR THE COMMITTEE

The Committee may choose to:

1. approve the PETE and/or the all-container recycling rate; or
2. direct staff to re-assess either or both rates.

IV. STAFF RECOMMENDATION

A. All-Container Rate

Staff recommends the Committee forward the 1995 all-container recycling rate of 25.2% to the Board for approval.

B. PETE Recycling Rate

Staff recommends the Committee forward the 1995 PETE recycling rate of 38.8% to the Board for approval.

V. ANALYSIS

A. All-Container Recycling Rate

This section describes the process by which the all-container recycling rate was developed and the roles of the Board's Recycling Rate Advisory Committee (RRAC) and an in-house review committee.

At last July's Board meeting, the Board directed staff work with APC's contractor to determine the all-container recycling rate for 1995. The APC's contractor, Cascadia Consulting Group, Inc. met with the RRAC six times. At the first three meetings, Cascadia received comments on the methodology and, based on RRAC input, revised the method to survey recylers, which included revisions to the survey questionnaire itself. The results of the study were presented to the RRAC on three occasions. The RRAC made substantial comments on the yield loss factors, the methods to adjust for non-survey response, and possible double counting of recycled RPPCs. The RRAC met twice to review the RPPC recycle data and once to review the RPPC generation data.

The Board also assembled an in-house review committee to review Cascadia's work. The in-house review committee was composed of individuals from the Policy and Analysis Office, the Local Assistance and Planning Division, and the Administrative and Finance Division. The in-house committee did not reject the study's outcome.

Questions were raised whether the approach over- or under-estimated the actual pounds of RPPCs recycled in California during 1995. Questions were raised about the sampling techniques used to determine the pounds of RPPCs disposed in California landfills. These questions and other issues raised by RRAC members during the course of the study's development are summarized in Attachment 6 of this Item.

The Draft Agenda package was mailed to the RRAC on July 2, 1996. The RRAC was asked to review the agenda and Attachments to see if it accurately reflected RRAC concerns. RRAC comments received prior to July 8 were incorporated into the final agenda item. Any comments reviewed after July 8 will be presented to the LAPC by staff at the July meeting. In addition, RRAC members were encouraged to attend the LAPC to present their comments to the Committee themselves or to send comments to the LAPC members.

Staff believes the approach and results from the Cascadia study are the best available for the Board to consider. Various

"benchmarks," using a wide variety of alternative methods, data, and comparisons, clearly showed the pounds of rigid plastic recycled and disposed as determined during the Cascadia study are "within the ballpark" of all those benchmarks. These benchmarks are presented in Attachment 5.

Methodology

Cascadia Consulting, in consultation with the Board's Recycling Rate Advisory Committee and Board staff, developed a method to calculate the amount of all RPPCs recycled and disposed in California. The methodology was designed to determine the values needed to calculate the all-container recycling rate using the following formula:

$$\text{Recycling Rate} = \frac{\text{tons of RPPCs recycled during 1995}}{\text{tons of RPPCs generated during 1995}} \times 100$$

The tons of RPPCs generated is the sum of the tons of RPPCs recycled plus the tons of RPPCs disposed in California landfills.

Tons Disposed

To calculate RPPC disposal, the contractor conducted waste characterization analyses of samples from 24 randomly selected landfill and transfer stations throughout the State. Waste sorts were conducted on three disposal streams: commercial/industrial, residential, and self-haul. The waste sorts were performed in the summer and winter to account for seasonal differences.

The disposal data was reviewed by the RRAC at a meeting in June 1996.

Tons Recycled

To quantify the amount of RPPCs recycled in the State, the contractor, with help from Board staff, conducted a survey of municipalities (Level A); MRFs/processors (Level B); and reclaimers/exporters (Level C). The contractor, with the help of the RRAC, developed a method to extrapolate missing data from non-respondents at all three levels and determined yield loss factors (contaminants and throw-outs).

The Cascadia method was designed to provide independent results for Levels A, B, and C. The results for these three levels were analyzed through a comparison with one another and with other "benchmarks" (see Attachment 5). The tons recycled at Levels A,

B, and C are within 7.5% of each other, indicating highly consistent results.

The data from the RPPC recycling surveys for Levels A, B, and C were reviewed by the RRAC at meetings in May and June 1996.

Results

The results of the Cascadia study are summarized on the Table below:

RESULTS OF CASCADIA'S ALL-CONTAINER STUDY

DISPOSAL	% OF WASTE STREAM	% RPPC
Self-haul	21.2	0.27
Commercial/Industrial	51.0	0.71
Residential	27.8	1.05
TOTAL	100.0	0.71
RECYCLED	**TONS RECYCLED**	
Municipalities (Level A)	76,350	
Processors (Level B)	82,000	
Reclaimers (Level C)	76,300	
AVERAGE	78,200	

The RRAC agreed to average the results from the recycling surveys (Levels A, B, and C) to determine the tons of RPPCs recycled during 1995: 78,200. The amount of RPPCs in the disposed waste stream was also found to be 0.71% of the total (i.e., the weighted average of the three sub-streams).

Based on Board disposal information, 33,509,083 tons of waste were disposed in California landfills during 1995. Of these, 809,031 tons were disposed in non-MSW landfills (mono-fills), so did not contain any RPPCs. Thus, the total disposed which contained RPPCs was (33,509,083) - (809,031) = 32,700,052 tons.

The following equation was used to determine the All-Container Recycling Rate:

$$\text{Recycling Rate} = \frac{\text{tons of RPPCs recycled during 1995}}{\text{tons of RPPCs generated during 1995}} \times 100$$

$$\text{Recycling Rate} = \frac{78{,}200}{78{,}200 + (32{,}700{,}052 \times 0.71\%)} \times 100 = 25.2\%$$

where the tons of RPPCs generated during 1995 = tons RPPCs recycled + (total tons disposal x weighted average % RPPCs in disposal waste stream).

ALL-CONTAINER 1995 RECYCLING RATE = 25.2%

The complete analysis to determine the tons of RPPCs recycled is presented in Attachment 2; the detailed analysis to determine the tons generated is presented in Attachment 3.

The comments from the RRAC are summarized in Attachment 6, together with staff's response to those comments.

Benchmark of RPPC Survey Results

As noted above, three independent surveys were conducted for collectors, handlers/processors, and reclaimers/exporters. The APC consultant conducted bench-marking analyses to test the all-container results against approximations of PETE recovery and total RPPC recycling using independent secondary data sources. All benchmarking tests showed that the results from the Cascadia study, both for the tons recycled and the tons generated, were reasonable. The benchmarking analysis is described in Attachment 5.

Determination of Tons of RPPCs Generated Using National Data

As directed by the Board, staff calculated the amount of RPPCs generated in the State using national sales data. Staff used national resin sales data published in *Modern Plastics* and pro-rated the data to California. For each resin type, staff selected categories of resin by end-use RPPC market. The national resin data was prorated to California based on California's relative share of total U.S. population and non-durable goods retail sales data. The complete analysis to calculate the RPPCs generated using national data is presented in Attachment 4.

Staff calculated the 1995 all-container generation in California using national data to be 497,118 tons. Staff also computed the all-container recycling rate using national data to be 15.7 percent. This lower recycling rate is due to the fact that the tons of RPPcs generated in California using national data is much

greater than that determined through the Cascadia study (310,300 tons). There are a number of possible reasons for this difference:

1. The national rein sales reported for 1995 may include containers (such as baby bottles, fast food drink containers, and bicycle water bottles) which are not RPPCs as defined by California statute.

2. Some resin categories include sales to Canada.

3. Resin sold during 1995 may not become containers available for recycling/disposal during the year. Market conditions may encourage producers to build or reduce inventories of resin ready for container production; containers may be stored by the container manufacturer or by the product manufacturer; product in the containers may be warehoused, exported, stocked on grocery shelves, or reused by the consumer for other purposes.

4. Resin sold to container manufacturers may be lost during the container manufacturing process due to manufacturing losses or off-spec containers. Containers may also be exported.

5. Containers may also be lost while they are being filled because they are crushed, mislabeled, or half-filled. Containers with product may also be exported.

6. The methodology does not account for the resin produced in the U.S. and exported. Also, the amount of resin converted to RPPCs and exported with product is not known. Likewise, the amount of RPPCs imported into the U.S. is also unknown. Staff has no empirical data or reference to quantify the amount of RPPCs exported from or imported into the U.S. or to determine the magnitude of any error resulting from the exclusion of RPPC exports/imports.

7. The prorating methodology factors the national data by California's population and non-durable goods retail sales compared to the nation's. Since no accurate determination of California's RPPC recycling rate prior to 1995 is available, staff is unsure whether the two factors are the right ones to use, whether they account for a majority of the differences between California and the U.S. sales of containers, or whether the two factors should be weighted equally. Staff also has no RPPC consumption data to determine whether Californians "consume" RPPCs at the same rate as the national average.

8. The SPI data for 1995 "projects" resin sales for the fourth quarter of the year. Historically, the actual sales (which will be reported in January 1997) has caused the annual sales data to change by as much as ten percent.

9. National resin sales statistics exclude postconsumer recycled (PCR) resin data (which must be added to virgin resin sales data). PCR use is apparently unavailable from trade publications and would need to be obtained from a survey of plastic container manufacturers (the national rigid plastic recycling rate calculated by R.W.Beck for APC includes PCR, and is estimated by a separate survey of major container manufacturers).

Conclusions

Several issues were raised concerning the Cascadia methodology. For example, Cascadia's methodology used sampling for waste characterization and surveys to obtain data, made adjustments for non-respondents based on averages, and collected waste samples only twice during the year. Small errors in the waste sorting process translate into much larger errors when multiplied by the magnitude of the California waste stream. However, even with these considerations, staff believes the Cascadia method is the most accurate approach to estimate the all-container recycling rate for 1995.

Alternative methods likely would be no more accurate than the Cascadia method. Factoring national sales data in an attempt to estimate California generation likely over-estimates the tons of RPPCs generated in California as discussed previously. Using cash register sales data (from scanner information) to determine the RPPC generation also would require significant estimation (percent of sales not reported or not scanned, weight of the containers, accurate identification of container type) and could be cost prohibitive.

Compliance effect of the All-container Recycling Rate

PRC §42310(b) allows product manufacturers to use the all-container recycling rate to comply with the California RPPC Program if the rate is greater than 25% as determined by the Board. Since the 1995 rate is greater than 25%, every product manufacturer will be considered to be in compliance with the RPPC Program for 1995, even those producing food and cosmetic products, if the Board adopts the 25.2% all-container recycling rate.

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B. PETE Recycling Rate

A complete description of the method and data used to calculate the PETE RPPC recycling rate is presented in Attachment 1. The PETE rate was calculated from data provided by the Department of Conservation (DOC) and the periodical *Modern Plastics*. DOC's publication *Biannual Compendium of Beverage Container Sales, Returns and Redemption & Recycling Rates* provided the quantity of PETE recycled in the State and the quantity of California Refund Value (CRV) PETE soda bottles sold in California in 1995. To estimate the amount of other (non-soft drink bottle) PETE containers sold in California, information was taken from *Modern Plastics* and prorated to California using population and retail sales statistics.

This information and analysis indicate that 39,547 tons of PETE RPPCs were recycled in California in 1995, and 101,934 tons of PETE RPPCs were sold in the State. Applying these statistics to the Board-approved calculation methodology yields a PETE RPPC recycling rate of 38.6 percent in 1995.

PRC §42310(c) allows all product manufacturers using PETE containers to be found in compliance with the RPPC Program if the annual PETE recycling rate is greater than 55%. Since the 1995 PETE rate is less than 55% using the Board-approved methodology, this compliance option is not available to product manufacturers for 1995.

VI. ATTACHMENTS:

1. 1995 Rigid Plastic Packaging Container PETE Recycling Rate Calculation

2. 1995 Rigid Plastic Packaging Container All-Container Recycling Rate Amount Recycled (Numerator) Calculation

3. 1995 Rigid Plastic Packaging Container All-Container Recycling Rate Amount Generated (Denominator) Calculation

4. Alternative Calculation Methodology: All-container Recycling Rate Denominator Using National Resin Sales Data and Recycling Rate Advisory Committee Comment

5. Use of "Benchmarks" to Assess the Accuracy of the Numerator and Denominator

6. Comments Received from Recycling Rate Advisory Committee (RRAC) and Staff Response

VII. APPROVALS

Prepared by: Steve Storelli Steve Storelli Phone 255-2470

Reviewed by: Bill Huston Bill Huston Phone 255-2461

Reviewed by: Carole Brow Phone 255-2426

Reviewed by: Caren Trgovcich Phone 255-2320

Legal Review: 7/9/96 Phone _____

**1995 RIGID PLASTIC PACKAGING CONTAINER (RPPC)
PETE RECYCLING RATE**

DEFINITION of RIGID PLASTIC PACKAGING CONTAINER

The definition of "RPPC" used to calculate the recycling rate is taken from the regulations adopted by the Board on June 23, 1994 and reflects Public Resources Code (PRC) section 42301:

> "Rigid plastic packaging containers" means any plastic package having a relatively inflexible finite shape or form, with a minimum capacity of eight fluid ounces or its equivalent volume and a maximum capacity of five fluid gallons or its equivalent volume, that is capable of maintaining its shape while holding other products, including, but not limited to, bottles, cartons, and other receptacles, for sale or distribution in the state."

DEFINITION of PETE RECYCLING RATE

The definition of "recycling rate" is taken from the RPPC regulations:

> "The proportion, as measured by weight, volume, or number that rigid plastic packaging containers, notwithstanding the size limitations set forth in §17943 (b)(29) or the exemption status as set forth in §17946 (a)(2)(3) of the Article, in the aggregate, sold, or offered for sale in the state are being recycled in a given calendar year."

The recycling rate calculation (method) is not limited by the size limitations or exemptions [§ 17946 (a)(2)(3)] that define a RPPC. The PETE recycling rate will include all PETE rigid plastic packaging containers, regardless of size and exempt only those RPPCs which are those produced in California and shipped out of the state (with product) and containers manufactured for use in the shipment of hazardous materials.

RECYCLING RATE EQUATION

The formula for calculating PETE RPPC recycling rate is as follows:

$$\text{PETE RPPC Recycling Rate} = \frac{\text{PETE RPPC Tonnage Recycled in CA}}{\text{PETE RPPC Tonnage Sold in CA}} * 100$$

The data for estimating the numerator and denominator are referenced below. A description of data sources used to determine the PETE recycling rate will be presented along with data representing the year 1995.

A. Units for Calculating Recycling Rates

The recycling rate calculation will be based on weight since existing statistics for generation, recycling, and landfilling of plastics are also documented by weight and consistent with measurement methods used by the recycling and packaging industries, AB 939, and AB 2494 reporting requirements. Department of Conservation data (AB 2020), while provided as container counts, is converted to weight.

B. Sources of PETE Recovery Data

Numerator: PETE RPPC Tonnage Recycled in California

The numerator (PETE RPPC tonnage recycled in California) was estimated using statistics from the following data set:

- Department of Conservation (DOC), Division of Recycling, California Redemption Value (CRV) plastic soda beverage containers, and New Postfilled containers.

The Department of Conservation's Division of Recycling monitors sales and returns of plastic beverage containers regulated by AB 2020, the Beverage Container Recycling and Litter Reduction Act. Statistics are maintained and published by container count in DOC's "Biannual Compendium of Beverage Container Sales, Returns and Redemption & Recycling Rates". Six month summaries of sales and recycled are published in March and September. Thus, the report documenting 1995 was published in March 1995 and provides the number of PETE plastic soft drink containers sold and recycled in California.

The biannual report also includes the number of PETE new postfilled containers (non-soft drink containers) recovered in California. The data for recovered non-CRV postfilled containers (known as "custom containers") will also be included in the numerator.

The DOC reports the number of plastic soda beverage containers and postfilled containers recovered in California. DOC also reports the number of recycled soda beverage and postfilled containers per pound. The number of recycled containers per pound are taken from samples at recycling centers. To estimate the tons of recycled soda beverage and postfilled containers, the number of containers recovered are divided by the number of containers per ton.

The following three equations indicate how DOC PETE recovery data is used to calculate CRV soda recovery for 1995.

Equation (1) estimates the tons of DOC CRV soda beverage containers recovered in California.

(1) CRV Soda = Soda Btl ÷ Soda Btl/lb ÷ lbs/ton

Where:

CRV Soda	=	tons of CRV soda beverage containers recovered in California in one calendar year,
Soda Btl	=	number of CRV soda beverage containers recovered in one calendar year as reported by DOC,
Soda Btl/lb	=	number of CRV soda beverage containers in one pound as reported by DOC,
lbs/ton	=	number of pounds per ton (2000).

Equation (1) is evaluated using DOC CRV recovered soda beverage container data for 1995.

$$\text{CRV soda} = \frac{448{,}882{,}966 \text{ containers}}{7.4 \text{ containers per pound}} \div \frac{2000 \text{ lbs}}{\text{ton}}$$

$$= 66{,}065{,}266/2000$$

$$= 33{,}033 \text{ tons}$$

The results of equation (1) indicate that 33,033 tons of CRV PETE soda beverage containers were recovered in California in 1995.

Equation (2) estimates the tons of DOC new postfilled (custom) containers recovered in California.

(2) DOC Post = New Post ÷ New Post/lb ÷ lbs/ton

Where:

DOC Post	=	tons of new postfilled containers recovered in California in one calendar year,
New Post	=	number of new postfilled containers recovered in one calendar year as reported by DOC,

New Post/lb = number of postfilled containers in one pound as reported by DOC,

lbs/ton = number of pounds per ton (2000).

Equation (2) is evaluated using DOC recovered new postfilled container data for 1995.

$$\text{DOC Post} = \frac{99,011,197 \text{ containers}}{7.6 \text{ containers per pound}} \div \frac{2000 \text{ lbs}}{\text{ton}}$$

$$= 13,027,789 \div 2000$$

$$= 6,514 \text{ tons}$$

The results of equation (2) indicate that 6,514 tons of new postfilled containers were recovered in California in 1995.

Using the results of equations (1) and (2), equation (3) will provide the total tons of DOC PETE containers recovered in California.

(3) TL Rec = CRV Soda + DOC Post

Where:

TL Rec = total tons of DOC PETE containers recovered in California in one calendar year;

CRV Soda = tons of CRV soda beverage containers recovered in California in one calendar year (from equation 1);

DOC Post = tons of new postfilled containers recovered in California in one calendar year (from equation 2).

Using the values estimated in equations (1) and (2), equation (3) is evaluated. The results of equation (3) indicate that 39,547 tons of PETE containers were recovered in California in 1995.

TL Rec = 33,033 + 6,514

= 39,547 tons

C. SOURCES OF PETE RESIN SALES DATA

Denominator: PETE RPPC Tonnage Generated (sold) in California

The denominator, PETE RPPC tonnage generated in California, is determined by integrating statistics from the following two data

sets:

- DOC CRV plastic soda beverage container sales data, and
- National PETE custom bottle resin sales data published in the periodical *Modern Plastics*.

1. Department of Conservation Data

As referenced above, the DOC tracks the number of CRV plastic soda beverage containers sold in California. Statistics are maintained and published by container count in DOC's "Biannual Compendium of Beverage Container Sales, Returns and Redemption & Recycling Rates." Year-end summaries of sales are published in March of the following year. Information from DOC will provide the container count of plastic soda beverage containers sold in California in a calendar year. To estimate the <u>tons</u> of soft drink containers sold in California, the number of containers sold is divided by the number of soft drink containers per pound. DOC estimates the number of <u>recycled</u> soda beverage and postfilled containers per pound. These containers may contain contaminants (e.g., rings, labels, liquid, etc.) and may not accurately represent the number of <u>new</u> containers per pound. If new containers were used, the estimate of containers per pound would most likely be greater than recycled containers per pound. The resulting sales tonnage, using new container per pound estimates, would also likely be less than those presented. The DOC is attempting to investigate the weight of new containers. As DOC revises its container per pound estimate, it will be used in the calculation.

Equation (4) estimates the tons of DOC CRV soda beverage containers sold in California.

(4) CRV Soda Sales = Soda Btl Sales ÷ Soda Btl/lb ÷ lbs/ton

Where:

CRV Soda Sales = tons of CRV soda beverage containers sold in California in one calendar year,

Soda Btl Sales = number of CRV soda beverage containers sold in California in one calendar year as reported by DOC,

Soda Btl/lb = number of CRV soda beverage containers in one pound as reported by DOC,

lbs/ton = number of pounds per ton (2000).

Equation (4) is evaluated using DOC CRV soda beverage container sales data for 1995.

$$\text{CRV Soda Sales} = \frac{760{,}783{,}391 \text{ containers sold}}{7.4 \text{ containers per lb}} \div \frac{2000 \text{ lbs}}{\text{ton}}$$

$$= 102{,}808{,}566 / 2000$$

$$= 51{,}404 \text{ tons}$$

The results of equation (4) indicate that 51,404 tons of soda beverage containers were sold in California in 1995.

2. *Modern Plastics* Data

National resin sales are published annually in the January edition of *Modern Plastics*, a magazine published by McGraw-Hill. The Society of Plastic Industries (SPI), through its Committee on Resin Statistics (CRS), establishes the data collection methodology and data review. The survey is developed and conducted by the firm Ernst & Young. The data presented in *Modern Plastics* are based on SPI data. In order for *Modern Plastics* to have year-end totals prepared for their January publication, fourth quarter sales are based on projections. These projections are adjusted in the following year's edition. Thus, the January 1996 issue presents sales for 1995 (incorporating a projected fourth quarter) and includes the adjusted resin sales for 1994.

Sellers of resin report monthly sales by weight in the following ways: by resin type; by amount sold for various applications within a resin type; and by the amount sold in major resin markets, including for packaging and containers. Monthly sales reported by each company are cross checked with the company's sales for the previous month and with sales for the same month, one year prior. Totals are not adjusted for non-reporting resin sellers.

The packaging and container statistics assembled by Modern Plastics identify the amount of each resin type sold for producing containers, closures, coatings, and films. Tonnage estimates representing the amount of PETE custom bottle resign sales will be obtained from the category PETE custom bottles. Equation (5) incorporates national custom bottle resin sales data for 1995 into the methodology.

(5) US CBottle = Tons of PETE custom bottle resin sales in U.S.

= 440,000 tons

The national custom bottle resin sales tonnage will be extrapolated to California based on California's share of US population and retail sales. This procedure is presented in the following section.

Extrapolation of U.S. Custom Bottle Resin Sales Data to California

The next step to estimate California generation of PETE custom bottle resin sales is to prorate nationwide custom bottle resin sales to California. The scaling factor for this proration is based on equal weights of California population and economic activity compared to the U.S. This is calculated in equation (6).

(6) $$\text{CA Share} = 0.5 \frac{\text{CA Pop}}{\text{US Pop}} + 0.5 \frac{\text{CA RS}}{\text{US RS}}$$

Where:

CA Share = scaling factor to apportion US custom bottle resin sales to California,

CA Pop = California population in a calendar year,

US Pop = US population in a calendar year,

CA RS = dollar value (millions) of non-durable good retail sales in California in a calendar year,

US RS = dollar value (millions) of non-durable good retail sales in the US in a calendar year.

Population totals for California are taken from estimates prepared by the State of California, Department of Finance, Demographic Research Unit. Estimates of U.S. population are prepared by the U.S. Department of Census and available from the Department of Finance. Estimates of nondurable good retail sales are taken from the U.S. Department of Commerce, Current Business Reports.

Equation (6) is evaluated using population data and U.S. Department of Commerce non-durable goods retail sales data for 1995.

$$\text{CA Share} = 0.5\ \frac{32{,}344{,}000^{1}}{263{,}434{,}000^{3}} + 0.5\ \frac{\$153{,}800^{2}}{\$1{,}406{,}952^{4}}$$

$$= 0.5(0.123) + 0.5(0.109)$$

$$\text{CA Share} = 0.116$$

California custom bottle resin sales are estimated by multiplying the tonnage of national custom bottle resin sales by CA Share; the resulting tonnage is then multiplied by 0.99 to account for a 1 percent resin loss that occurs during the container manufacturing process (Franklin Associates, 1992). This calculation is presented in the equation (7).

(7) $\text{CA CBottle} = \text{US CBottle} * \text{CA Share} * 0.99$

Where:

CA CBottle	=	tons of PETE custom bottle resin sales in California in one calendar year,
US CBottle	=	tons of PETE custom bottle resin sales in U.S. in one calendar year,
CA Share	=	scaling factor to apportion US custom bottle resin sales to California,
0.99	=	1 percent resin loss factor.

Equation (7) is evaluated using the scaling factor estimated from equation (6) and resin sale statistics taken from Modern Plastics for 1995.

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1 Conversation with analyst at the Department of Finance, Demographic Research Unit, April 22, 1996.

2 Conversation with analyst at the California Trade and Commerce Agency, Office of Economic Research, April 22, 1996. Data taken from U.S. Department of Commerce, Current Business Reports, ($million).

3 Conversation with analyst at the Department of Finance, Demographic Research Unit, April 22, 1996.

4 Conversation with analyst at the California Trade and Commerce Agency, Office of Economic Research, April 22, 1996. Data taken from U.S. Department of Commerce, Current Business Reports, ($million).

CA CBottle = 440,000 * 0.116 * 0.99

= 50,529 tons

The results indicate that 50,529 tons of custom resin were sold in California in 1995.

The last step is to add the tons of DOC CRV soda beverage containers sales to the tons of custom bottles sold in California. Equation (8) presents this calculation.

(8) TL Sold = CA CBottle + CRV Soda Sales

Where:

TL Sold	=	total tons of PETE containers sold in California in one calendar year,
CA CBottle	=	tons of PETE custom bottle resin sales in California in one calendar year,
CRV Soda Sales	=	tons of CRV soda beverage containers sold in California in one calendar year.

Equation (8) is evaluated as:

TL Sold = 50,529 tons + 51,404 tons

= 101,934 tons

Equation (8) indicates that 101,934 tons of PETE were sold as containers in California in 1995.

PETE RATE CALCULATION 1995

The PETE recycling rate (percent) is calculated in equation (9) using information taken from equations (3) and (8) above.

(9) PETE Rate(%) = TL REC ÷ TL Sold * 100

Where:

PETE Rate(%)	=	recycling rate percentage for PETE RPPC containers representing one calendar year.
TL REC	=	total tons of DOC PETE containers recovered in California in one calendar year (from equation 3).

TL Sold = total tons of PETE containers sold in California in one calendar year (from equation 8).

Equation (9) is evaluated using total PETE recovery and sales data for California for 1995.

PETE Rate % = 39,547 / 101,934 * 100

= 38.8 %

The results of equation (9) indicate that the RPPC recycling rate for PETE containers in 1995 is **38.8%** in **1995**.

1995 Rigid Plastic Packaging Container All-Container Recycling Rate
NUMERATOR Calculation

CALIFORNIA RPPC RECYCLING RATE STUDY

RESULTS OF THE
RPPC RECYCLING SURVEYS

PRESENTED TO THE
RRAC

BY
CASCADIA CONSULTING GROUP

MAY 30, 1996
REVISED JUNE 12, 1996

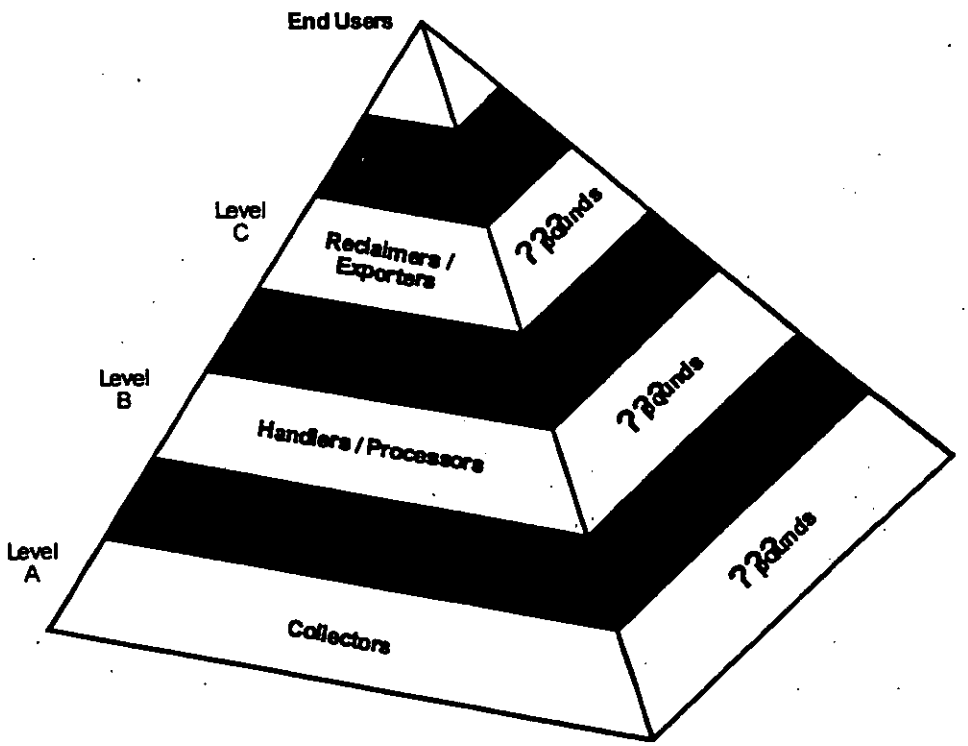
Overview of Approach

Pyramid approach: measurement at three separate levels

- **Level A: Collectors**
  This survey measures the quantity of RPPCs ***collected*** for recycling. The survey targeted all municipal collection programs (CSs) plus a random selection of private recycling sites. Surveyed private recyclers were randomly selected from the DOC's database of active recyclers with state certification numbers under three different categories: CPs (collection programs), RCs (buy-back and drop-off centers), and RCSSs (buy-back and drop-off centers at supermarket sites).

- **Level B: Handlers/Processors (MRFs)**
  This survey measures the quantity of RPPCs ***baled*** for shipment to a reclaimer or end-user. The targeted survey recipients were all the known handlers and processors (MRFs) who baled RPPCs, but did not wash or pelletize RPPCs. Handlers and processors were identified through a combination of DOC, CIWMB, and California-based recycling association databases.

- **Level C: Reclaimers/Exporters**
  This survey targeted companies involved in ***cleaning/washing, grinding, or exporting*** RPPCs recovered from California. This survey measures the quantity of RPPCs recovered from California and domestically processed into a form ready for end-use, or the quantity exported. Reclaimers and exporters were surveyed.



Process:

1. Mailing lists for each survey level were compiled.
2. Survey instruments for each level were designed, reviewed by the RRAC and CIWMB staff, tested and mailed.
3. Survey responses were reviewed, and unclear/incomplete responses were verified by telephone.
4. Data were entered into a database with separate tables for each level.
5. Extensive, repeated phone follow-up was conducted with all non-respondents over a 2-month period. Final response rates are summarized in Table 1.

Table 1
Response Rates for Each Survey Level

Level	LEVEL A COLLECTORS				LEVEL B HANDLERS/ PROCESSORS	LEVEL C RECLAIMERS/ EXPORTERS
Responsibility	CS (CIWMB)	CP (Cascadia)	RC (Cascadia)	RCSS (Cascadia)	(Cascadia)	(RW Beck)
Surveys Mailed	**379**	**100**	**150**	**150**	**249**	**208**
Surveys Returned	**134**	**55**	**65**	**104**	**210**	**178**
Number Reporting RPPC Data	131	29	50	100	103	48
Number Reporting "Do Not handle RPPCs"	3	26	15	4	107	130
Surveys Not Returned	**245**	**45**	**85**	**46**	**39**	**30**
Survey Response Rate	**35%**	**55%**	**43%**	**69%**	**84%**	**86%**

Level A: Collectors

Methodology:

Municipality Survey

1. CIWMB staff sent surveys to 379 curbside collection programs and conducted 3 follow-up calls with programs that in aggregate represent 80% of households served by collection programs.
2. Cascadia entered survey data into database. Data for each responding municipality were entered according to the types of RPPCs collected (PET only; PET & HDPE Natural; PET & All HDPE; all RPPCs). Household recovery rates (lbs/HH) were calculated for each of the four different RPPC collection types (see attachment 1).
3. Cascadia estimated total municipal RPPC recovery by multiplying the per household recovery rates (for each type of RPPC collection) by the total number of households in California with each type of RPPC collection (attachment 1 shows detail). Household data were obtained from the 1995 DOC database that tracks households served and the type of RPPCs collected. Household numbers were verified by telephone in several cases.

Private Recyclers (Recyclers with State Certification Number)

1. Randomly selected 400 of 2,193 sites identified by DOC. Samples were stratified by CPs (collection programs), RCs (buy back and drop-off centers), and RCSSs (buy back and drop-off centers at supermarket sites) (see Table 1).
2. Mailed survey to all randomly selected site operators.
3. Conducted multiple follow-up phone calls with non-respondents over a two-month period.
4. Entered data into a database by program type (CP, RC, RCSS).
5. Eliminated double-counting (see attachment 2 for detailed explanation).
6. Subtracted the number of CP, RC, and RCSS sites that do not collect RPPCs from the total number of CP, RC, and RCSS sites using information provided by DOC (see attachment 3).
7. Projected results of survey to the universe of sites in operation as of December 31, 1995 (see attachment 3 for extrapolation method).

Other Collection Programs

1. Mailed surveys and conducted follow up phone calls with California collectors that did not appear on DOC Lists.

Aggregation of Collector Survey

1. Calculated the total quantity of RPPCs recovered in California by summing the totals of the municipality, private recycler, and other collection programs surveys (see Table 2).
2. Estimated total recycling using reclaimer/exporter yield loss factors derived from the survey of California reclaimers and exporters (see Table 3 and RW Beck letter on yield loss). "Other RPPCs" adjusted using the weighted average of yield loss factors obtained in the reclaimer/exporter survey.

Survey Results:

Table 2
Level A: Collector Survey Results
Estimated Pounds of RPPCs *Recovered* (1995)
(minus double counting)
(in millions of pounds)

Resin Type	Municipalities	Private Recyclers (Programs with State ID Numbers)	Other Collection Programs[1]	Total Recovered
PET Bottles[2]	23.9	55.3	0.6	**79.8**
HDPE Natural	37.5	22.2	0.3	**60.0**
HDPE Pigmented	15.5	11.6	0.1	**27.2**
Other RPPCs[3]	4.4	2.7	0.0	**7.1**
TOTAL	**81.3**	**91.8**	**1.0**	**174.1**

Table 3
Level A: Collector Survey Results
Estimated Pounds of RPPCs *Recycled* (1995)
(in millions of pounds)

Resin Type	Total Recovered	Yield Loss Factor	Total Recycled
PET Bottles[2]	79.8	13.5%	**69.0**
HDPE Natural	60.0	9.7%	**54.2**
HDPE Pigmented	27.2	14.5%	**23.3**
Other RPPCs[3]	7.1	12.3%[4]	**6.2**
TOTAL	**174.1**	NA	**152.7**

[1] Includes recycling collectors that did not appear in DOC database.

[2] "PET Bottles" category includes soda and custom bottles including base cups.

[3] "Other RPPCs" include non-bottle RPPCs and mixed bales.

[4] This yield loss is the weighted average of the PET, HDPE Natural, and HDPE Pigmented yield loss.

Level B: Handlers/Processors

Methodology:

1. Merged lists of California processors and handlers from DOC, CIWMB, and others, including the APC and RW Beck.
2. Mailed surveys to 249 potential handlers/processors identified from the mailing lists.
3. Made multiple follow-up phone calls to all non-respondents over a two-month period.
4. Entered data from those respondents that performed a "baling" function. Processors and handlers performing a "washing" or "pelletizing" function were included in the reclaimers/exporters survey. Data from respondents were verified where unclear and double entered to minimize data entry errors.
5. Eliminated double-counting through a query which compared the ID numbers of survey respondents to the ID number of where material is "sold to." Where there are matches in ID numbers, the query subtracted the "sold to" number from the "total" number for each resin type. (See attachment 2 for detailed explanation.)
6. Calculated total reported RPPCs recovered by summing the total quantity reported by respondents minus the total quantity double counted (see Table 4).
7. Estimated total reported RPPCs recycled by applying the yield loss factors obtained in the reclaimer/exporter survey to total recovered (see Table 5 and RW Beck letter on yield loss).
8. Estimated quantity of RPPCs recycled by non-respondents as described under the "Adjustment for Non-Respondents" section.
9. Added the quantity estimated to be recycled by non-respondents to the total recycled reported by respondents.

Survey Results:

Table 4
Level B: Handlers/Processors Survey Results
***Reported* Pounds of RPPCs *Recovered* (1995)**
(minus double counting; no projections for non-respondents)
(in millions of pounds)

Type	Exported	Sent to Reclaimer/ End-User	Sent to MRF/Broker	No Resin Split Provided	Total Recovered (Reported)
PET Bottles[2]	3.6	52.6	8.7	0.0	**64.9**
HDPE Natural	6.4	25.4	8.4	0.0	**40.2**
HDPE Pigmented	2.7	8.4	4.0	0.0	**15.1**
Unallocated RPPCs[5]	3.5	2.9	0.9	33.0	**40.3**
TOTAL	**16.2**	**89.3**	**22.0**	**33.0**	**160.5**

Table 4a
Level B: Handlers/Processors Survey Results
Estimated Allocation of Quantities Reported without Resin Split
(in millions of pounds)

Type	No Resin Split Provided	Estimated Resin Split[6]
PET Bottles[2]	0.0	**8.5**
HDPE Natural	0.0	**14.4**
HDPE Pigmented	0.0	**8.2**
Other RPPCs[3]	33.0	**1.9**
TOTAL	**33.0**	**33.0**

The final destination of the 33.0 million pounds of recovered RPPCs that were reported without a resin split is listed below. These estimates were provided verbally to the consultant.

- 10 million pounds estimated exported
- 23 million pounds estimated sent to reclaimers

[5] "Unallocated RPPCs" includes RPPCs coded 1-7 for which no split was available and mixed bale material.

[6] For each respondent that did not provide a resin split, the consultant obtained an estimate or verification on the resin split over the telephone.

Table 5
Level B: Handlers/Processors Survey Results
Estimated Pounds of RPPCs *Recycled* (1995)

(no projections for non-respondents)

(in millions of pounds)

Type	Total Recovered (Reported)	Yield Loss Factor	Total Recycled (Reported)
PET Bottles[2]	73.4	10.0%[7]	66.1
HDPE Natural	54.6	9.7%	49.3
HDPE Pigmented	23.3	14.5%	19.9
Other RPPCs[3]	9.2	5.7%	8.7
TOTAL	160.5	NA	144.0

Adjustment for Non-Respondents:

- Known missing data from several of California's largest handlers/processors.
- Eleven non-respondents said they baled PET for shipment to PRCC but would not report tonnages.
- Four respondents returned the survey indicating that they did not handle RPPCs; however, follow-up calls confirmed that in fact they do.
- The following steps were used to estimate quantity of RPPCs recycled by non-respondents. See attachment 5 for distribution of quantity reported by responding handlers/processors.

  a) Calculated the average pounds recycled (minus double counting) by reporting handlers/processors, before yield loss.
  (160.50m lbs ÷ 103 respondents = 1.56 m lbs per handler/processor)

  b) Grouped respondents into "large" and "small" handlers/processors. Large handlers/processors are those that handle above the average quantity; small handlers/processors are those that handle below the average quantity. Calculated the averages for both groups.
  Large handlers/processors = 4.47 m lbs; small handlers/processors = 0.33 m lbs

  c) Estimated the number of non-responding handlers/processors that handle RPPCs using the ratio of respondents reporting RPPCs to the total number responding.
  (103 respondents with data ÷ 210 total respondents = 49%)

  d) Applied the 49% to the 39 non-respondents to determine the number of non-respondents that are likely to handle RPPCs.
  (39 non-respondents x 49% = 19 non-respondents likely to handle RPPCs)

  e) Grouped the 19 non-respondents that are likely to handle RPPCs by size. Four non-respondents are large; the remainder were categorized as small. Grouping is based on knowledge of 4 large non-respondents; all other non-respondents assumed to be small.

---

[7] See attachment 4 for detail on why the handler/processor yield loss factor for PET bottles is less than that at the collector and reclaimer/exporter level.

f) Multiplied the average pounds recycled by each group times the number of non-respondents in each group. Added the results of both calculations to derive an estimate of 22.8 m lbs recovered.
(4 large handlers/processors x 4.47 m lbs + 15 small handlers/processors x 0.33 m lbs = 22.83 m lbs)

g) Adjusted for yield loss using the weighted average (12.2%) from the reclaimer/exporter survey to derive an estimate of recycling of 20.0 m lbs.
(22.8 m lbs x 87.8% = 20.0 m lbs)

h) Allocated the 20.0 m lbs to resins using reported resin split.

Table 6
Level B: Handlers/Processors Survey Results
Estimated *Total* Pounds of RPPC *Recycled* (1995)
(in millions of pounds)

Type	Reported Recycled	Estimated Recycled by Non-Respondents[8]	Total Recycled
PET Bottles[2]	66.1	9.0	**75.1**
HDPE Natural	49.3	7.0	**56.3**
HDPE Pigmented	19.9	2.8	**22.7**
Other RPPCs[5]	8.7	1.2	**9.9**
TOTAL	**144.0**	**20.0**	**164.0**

[8] Estimate is based on the assumption that the average pounds recycled per "large" and "small" handler/processor holds for at least 4 large and 15 small non-responding handlers/processors out of a total of 39 non-respondents. Assumes resin split is same as survey respondents.

Level C: Reclaimers/Exporters

Methodology:

1. Prepared mailing list using APC's National Post-Consumer Plastics Recycling Rate Study contact list, Port Import Export Research Service ("PIERS") database, and referrals provided by California contacts.
2. Developed cover letter and survey instrument and mailed to all firms on the contact list.
3. Obtained PET numbers from DOC and verified with PRCC.
4. Verified and entered data from survey respondents and conducted follow-up telephone calls to contacts not responding to the mail survey. Results are summarized in Table 7.
5. Calculated yield loss factors for each resin type. These factors were derived by calculating the difference between quantities reported as recovered and quantities reported as recycled, and dividing that difference by reported recovery. The resin specific yield loss was obtained by calculating a weighted average of each individual yield loss within each resin category (see RW Beck letter on yield loss).
6. Calculated reported "Total Recycled" by reducing recovered quantities (for both domestic and export quantities) using yield loss factors derived from the reclaimer/exporter survey (see Table 8).
7. Estimated the quantity recycled by non-responding exporters based on the average quantity reported by responding exporters as described under "Adjustment for Non-Respondents" section.
8. Added the estimate of quantity exported by non-respondents to the total quantity recycled reported.

Survey Results:

Table 7
Level C: Reclaimers/Exporters Survey Results
***Reported* Pounds of RPPCs *Recovered* (1995)**
(no projections for non-respondents)
(in millions of pounds)

Type	Exported	Reclaimers/ End-Users	Total Recovered (Reported)
PET Bottles[2]	NA	NA	**80.2**
HDPE Natural	13.7	34.6	**48.3**
HDPE Pigmented	14.6	11.0	**25.6**
Other RPPCs[3]	3.6	2.8	**6.4**
TOTAL	NA	NA	**160.5**

Table 8
Level C: Reclaimers/Exporters Survey Results
***Reported* Pounds of RPPCs *Recycled* (1995)**
(no projections for non-respondents)
(in millions of pounds)

Type	Total Recovered (Reported)	Yield Loss Factor	Total Recycled (Reported)
PET Bottles[2]	80.2	13.5%	**69.4**
HDPE Natural	48.3	9.7%	**43.6**
HDPE Pigmented	25.6	14.5%	**21.9**
Other RPPCs[3]	6.4	5.7%	**6.1**
TOTAL	**160.5**		**141.0**

Adjustment for Non-Respondents:

- Responses were not obtained from 14 known exporters who handled California RPPC's in 1995. No estimate was made for non-responding reclaimers.
- Exporters were reluctant to share information on plastics exports for a number of reasons, including trade restrictions in Pacific Rim countries, adverse media coverage, and the competitive marketplace.
- Estimated quantity of RPPCs exported by non-respondent exporters. See attachment 6 for detail on distribution of quantity reported by responding exporters.
  a. calculated the average pounds of RPPCs recycled by the 35 exporters that responded to the survey (0.83 m lbs).
  b. applied this average to the 14 known exporters that did not respond to the reclaimer/exporter survey.
  (0.83 m lbs x 14 = 11.62 m lbs)

Table 9
Level C: Reclaimers/Exporters Survey
Estimated *Total* Pounds of RPPCs *Recycled* (1995)

(in millions of pounds)

Type	Reported Recycled	Estimated Recycled by Non-Responding Exporters[9]	Total Recycled
PET Bottles[2]	69.4		**69.4**
HDPE Natural	43.6	5.0	**48.6**
HDPE Pigmented	21.9	5.3	**27.2**
Other RPPCs[3]	6.1	1.3	**7.4**
TOTAL	**141.0**	**11.6**	**152.6**

Table 9a
Level C: Reclaimers/Exporters Survey Results
Estimated Split of Recycled RPPCs from Exporters and Reclaimers/End-Users

(in millions of pounds)

Type	Exported	Reclaimers/ End-Users	Total Recycled
PET Bottles[2]	NA	NA	**69.4**
HDPE Natural	17.7	30.9	**48.6**
HDPE Pigmented	11.0	16.2	**27.2**
Other RPPCs[3]	4.7	2.7	**7.4**
TOTAL	NA	NA	**152.6**

[9] Based on assumption that average pounds recycled per exporter holds for 14 known exporters that did not respond to the reclaimer/exporter survey.

Comparisons of Results

Table 10

Total Pounds of RPPCs Recycled based on Survey Results (1995)

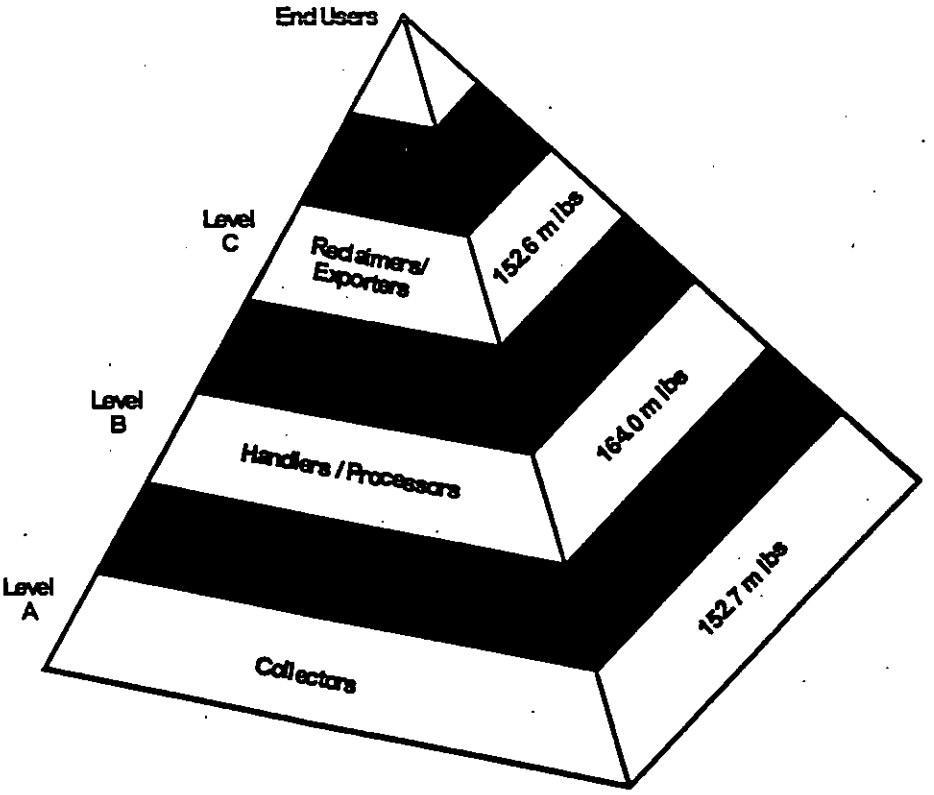
in millions of pounds	Collectors (Sampling based Survey)	Handlers/ Processors (Census Survey)	Reclaimers/ Exporters (Census Survey)
PET Bottles[2]	69.0	66.1	69.4
HDPE Natural	54.2	49.3	43.6
HDPE Pigmented	23.3	19.9	21.9
Other RPPCs[3]	6.2	8.7	6.1
Total	**152.7**	**144.0**	**141.0**

Table 10a

Estimated Total Pounds of RPPCs Recycled (1995)

(adjusted for non-responding Handlers/Processors and Exporters)

in millions of pounds	Collectors	Handlers/Processors	Reclaimers/Exporters
PET Bottles[2]	69.0	75.1	69.4
HDPE Natural	54.2	56.3	48.6
HDPE Pigmented	23.3	22.7	27.2
Other RPPCs[3]	6.2	9.9	7.4
Total	**152.7**	**164.0**	**152.6**



Bench-Marking

The objective of the bench-marking was to test the relative magnitude of the survey results against approximations of PET recovery and total RPPC recycling obtained using independent secondary data sources. Three separate bench-marking methods were used and are presented below.

Method #1: Bench-Marking with DOC Data

The survey results for PET are compared to DOC's record of PET recovered. For Level A, the results of the sample survey were projected to the universe of programs using statistical methods to estimate total recovery. For Level B, only the quantity reported by respondents is compared (no estimates made for non-respondents). This approach is not applicable to Level C since DOC data were assumed to be correct. This method is one measure of how complete the survey results for Level A and Level B were.

Method #2: Approximate Total RPPC Recycling Using DOC PET Data and Reported Resin Split

For this method, the total quantity of RPPCs recovered is approximated based on recovered PET as reported by DOC (80.2 m lbs). Total recovery is approximated by dividing PET recovered by the percentage of PET as a proportion of all RPPCs recovered using data obtained in the collector survey. The total quantity recycled is then approximated by applying the average yield loss factor to total recovery. This method provides one approximation of total recycling against which survey results can be compared. This method assumes that the DOC PET data are accurate and that the resin split reported in the collector survey is correct.

Method #3: Approximate Total RPPC Recycling Using National Data

The total quantity of RPPCs recycled is approximated using APCs most recent national recycling data for non-PET resins and applying it to California based on California's relative share of total US population served by curbside programs. This method is thought to be a conservative approximation of total recycling for two reasons. First, a higher percentage of curbside programs in California collect RPPCs than in other states. Second, extrapolation based on population with access to curbside does not account for California's expansive drop-off and buy-back infrastructure.

Method #1: Bench-Marking with DOC Data

Table 11 compares the results of the Level A, Level B, and Level C survey to DOC data on PET recovery as described on the previous page.

Table 11
Cascadia Survey Results vs. DOC Data (for PET only)
(unadjusted for yield loss and non-respondents)

in million of pounds	Cascadia	DOC	Cascadia % Difference from DOC
RC (including SS)	51.3	52.7	-2.7%
CP	2.6	3.4	-23.5%
Municipals	23.9	22.2	+7.7%
RV	1.4	1.4	0.0%
Total Collectors	**79.2**[10]	**79.7**[11]	**-0.6%**
Handlers/Processors	**66.1**	**80.2**	**-17.6%**
Reclaimers/Exporters	**80.2**[12]	**80.2**	**0.0%**

Method #2: Approximate Total RPPC Recycling Using DOC PET Data and Reported Resin Split

Approximate quantity of RPPCs recycled by:

a. Assuming that 1995 PET recovery equals 80.2 million pounds, based on DOC data.
b. Assuming that PET recovery equals 45% of total RPPC recovery, based on collector survey results.
c. Projecting Total 1995 Recovery at 178.2 million pounds.
   80.2 m lbs (of recovered PET) ÷ 45% (estimated % PET recovered) = 178.2 m lbs
d. Adjusting for process loss using average resin-specific loss factors reported in reclaimer/exporter survey (12.15%).
   178.2 m lbs x 87.85% = 156.6 m lbs

Approximation of Total RPPCs Recycled = 156.6 million pounds

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[10] Does not include 0.6 million pounds collected by non-state certified recyclers.

[11] Does not include quantities collected by SP programs, special programs such as boy scout collection drives.

[12] No independent estimate was made of this figure which was provided by DOC and verified by PRCC.

Method #3: Approximate Total RPPC Recycling Using National Data

Approximate quantity of RPPCs recycled by:

a. Allocating RW Beck's preliminary national post-consumer recycled HDPE quantities to California, based on California's relative share of the total U.S. population served by curbside collection. (California's percent of national population served by curbside collection is 15.5% –18.7 million divided by 121 million – according to *Biocycle*, April 1996.)
(531.9 m lbs x 15.5% = 82.4 m lbs)

b. Allocating RW Beck's preliminary national post-consumer recycled other RPPC quantities to California, based on California's relative share of the total U.S. population served by curbside collection.
(15.9 m lbs x 15.5% = 2.5 m lbs)

c. Determining the quantity of other RPPCs (drums, barrels, and pails) that the national survey does not obtain data for but which are defined as RPPCs in California. The reclailmer/exporter survey identified 4.0 m lbs of these other RPPCs.

d. Adding the amounts from the national survey to recycled PET (69.4 m lbs) and other RPPCs (4.0 m lbs) from Reclaimer/Exporter survey.
(69.4 m lbs + 82.4 m lbs + 2.5 m lbs + 4.0 m lbs = 158.3 m lbs)

Approximation of Total RPPCs Recycled = 158.3 million pounds

Attachments

Attachment 1: Detail of Municipality Extrapolations

Attachment 2: Detail of Elimination of Double Counting

Attachment 3: Detail of Private Recycler Extrapolations

Attachment 4: Explanation of PET Bottle Yield Loss Factor for Handlers/Processors

Attachment 5: Distribution of Handler/Processor Quantities

Attachment 6: Distribution of Exporter Quantities

Attachment 1: Detail of Municipality Extrapolations

SURVEY RESPONSES

MATERIALS COLLECTED	# HH SERVED	LBS REPORTED	TOTAL LBS/HH/YR	PET LBS/HH/YR	HDPE N LBS/HH/YR	HDPE P LBS/HH/YR	OTHER/ MIXED RPPCS LBS/HH/YR
PET Only	67,890	399,830	5.89	5.89	-	-	-
PET/HDPE N	600,321	6,305,100	10.50	4.10	6.25	-	0.15
PET/HDPE All	2,796,685	34,194,997	12.23	3.32	5.45	2.99	0.47
All Bottles/RPPCs	90,724	1,652,667	18.22	4.89	8.13	2.98	2.22
TOTAL	**3,555,620**	**42,552,595**					

EXTRAPOLATIONS (in millions of pounds)

MATERIALS COLLECTED	TOTAL # HOUSEHOLDS WITH COLLECTION	ESTIMATED PET	ESTIMATED HDPE N	ESTIMATED HDPE P	ESTIMATED OTHER/ MIXED RPPCS	TOTAL EXTRAPOLATED LBS
PET	138,900	0.8	0.0	0.0	0.0	0.8
PET/HDPE N	1,024,081	4.2	6.4	0.0	0.2	10.8
PET/HDPE All	4,190,535	13.9	22.8	12.5	2.0	51.2
All Bottles/RPPCs	1,013,484	5.0	8.2	3.0	2.2	18.5
TOTAL	**6,367,000**	**23.9**	**37.5**	**15.5**	**4.4**	**81.3**

Attachment 2: Detail of Elimination of Double Counting

Data on pounds "sent to" other MRF/Processors or Brokers/Recycler is entered in two tables in the database. The first table, "Main Database Table," is essentially a copy of the survey form. Data is entered in the second table, "Double Counting Sub-Form," only if the respondent ships materials to another MRF/Processor or Broker/Recycler. (The survey also asks for the names of who materials are shipped to.) The two tables are then compared using a query which searches for ID numbers, as described below.

FROM SURVEY TABLE 3: 1995 RPPC QUANTITIES SENT ON FOR RECYCLING

MAIN DATABASE TABLE

ENTRIES FOR ALL SURVEY RESPONDENT BY ID NUMBER

Resin	Total Lbs Sent for Recycling	Lbs Exported Directly	Lbs sent to Reclaimer/ End-User	Lbs Sent to MRF/Processor	Lbs Sent to a Broker or Recycler
PET HDPE Natural HDPE Pigmented Other or Mixed	X,XXX	Y,YYY	Z,ZZZ	A,AAA C,CCC	B,BBB

DOUBLE COUNTING SUB-FORM

ENTRIES FOR SURVEY RESPONDENTS WITH POTENTIAL FOR DOUBLE COUNTING BY ID NUMBER

ID NUMBERS		LBS RECEIVED FROM SURVEY RESPONDENTS			
SURVEY RESPONDENT	MRF/PROCESSOR/ BROKER/RECYCLER	PET	HDPE NATURAL	HDPE PIGMENTED	OTHER OR MIXED
ID1	ID2	0.5*A,AAA	1*C,CCC		
ID1	ID3	1*B,BBB			
ID1	ID4	0.5*A,AAA			

DOUBLE COUNTING QUERY

1. Sums all columns from all survey respondents in "Main Database Table" by column and resin.
2. Searches for survey respondent id numbers with matching ID numbers in mrf/processor/broker/recycler column of "Double Counting Sub-Form."
3. Sums total pounds in "double counting sub-form" by resin for matching ID numbers.
4. Subtracts resulting sum of "Double Counting Sub-Form" from sum of "Main Table."

Attachment 3: Detail of Private Recycler Extrapolations

TYPE	# SITES	TOTAL POUNDS	MEAN POUNDS/ SITE	# OF RPPC SITES IN CA	EXTRAPOLATED TOTAL POUNDS (m lbs)
CP	29	4,921,445	169,705	61	10.4
RC	50	3,808,400	76,168	874	66.6
RCSS	100	1,271,300	12,713	1,053	13.4
RV PER DOC					1.4
TOTAL	**179**	**10,001,145**	**258,586**	**1,988**	**91.7**

Adjusted for sites not handling RPPCs
CPs = 34% * 182 = 61 per MH @ DOC
RCs = (959 - 85) = 874 per MH @ DOC
RCSSs = (1060 - 7) = 1053 per MH @ DOC

Detail of Resin Split

Mean values of each resin, by program type

	CP	RC	RC SS
PET	42,723	43,517	12,568
HDPE N	65,916	20,683	58
HDPE P	34,591	10,855	8
mixed	26,474	1,113	78
Mean, All resins	169,705	76,168	12,713

Note: differences are due to rounding

Total Number of Sites active 12/31/95	
CP's	61
RC's	874
RC SS's	1053

To arrive at the projections:
1. By program type, the mean was taken for each resin type. For example, the mean of the 100 completed RCSS sites was calculated.
2. The mean was multiplied by the # of programs active on 12/31/95 to reach the projected value for each resin type.
3. Values were summed across all program types to reach total projections.

Projections:

	*cp * 61*	*rc * 874*	*rc ss * 1053*	*rv total added*	*TOTALS*
PET	2,606,130	38,033,753	13,234,304	1,400,000	55,274,188
HDPE N	4,020,859	18,076,925	61,316		22,159,100
HDPE P	2,110,080	9,487,218	8,635		11,605,933
Other RPPCs	1,614,920	973,077	82,555		2,670,552
Total	10,351,990	66,570,972	13,386,810	1,400,000	91,709,772

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Attachment 4: Explanation of PET Bottle Yield Loss Factor for Handlers/Processors

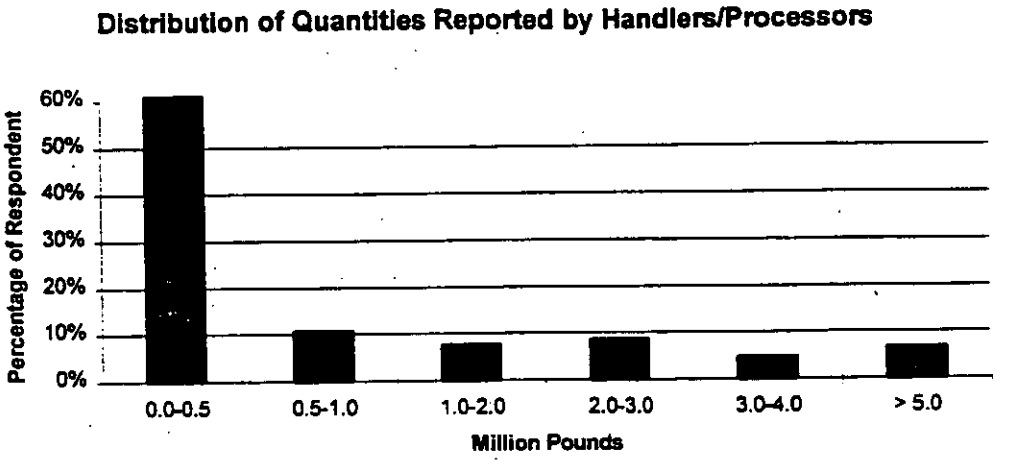
1. The DOC measurement of PET bottles occurs at the point where certified collectors deliver materials to certified processors. Specifically, the quantity measured by DOC is what goes in to Level B.
2. Some amount of loss occurs between what is delivered to Level B and what is shipped out of Level B (the point of measurement for all other resins).
3. PRCC estimates a 13.5% yield loss (based on records maintained by PRCC) between Level A and Level C.
4. Based on records maintained by PRCC, yield loss between Level B and Level C is 10%.

LEVEL A	LEVEL B		LEVEL C	
shipped	delivered	shipped	delivered	pcr/export
	80.2 m lbs	?	?	69.4 m lbs

13.5%

10%

Attachment 5: Distribution of Handler/Processor Quantities

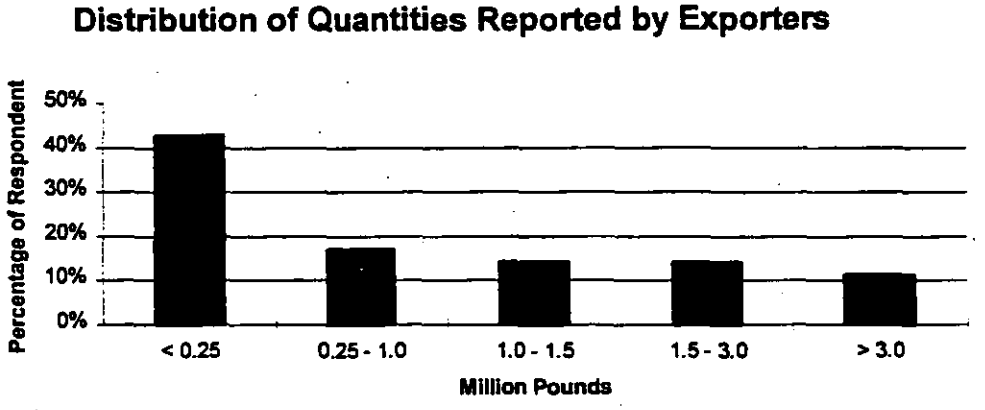


Average = 1.56 m lbs
Median = 0.42 m lbs

Average of respondents above 1.56 m lbs (large): 4.47 m lbs
Number of large respondents: 26

Average of respondents below 1.56 m lbs (small): 0.33 m lbs
Number of small respondents: 77

Attachment 6: Distribution of Exporter Quantities



Average = 0.83 m lbs
Median = 0.40 m lbs

1995 Rigid Plastic Packaging Container All-Container Recycling Rate

Denominator Calculation

CALIFORNIA RPPC RECYCLING RATE STUDY

RESULTS OF
WASTE STREAM SAMPLING

PRESENTED TO THE
RRAC

BY

CASCADIA CONSULTING GROUP

JUNE 12, 1996

Overview of Methodology

Apportioned samples among the three primary substreams to provide reliable estimates of total RPPCs in California's MSW stream (see Table 1).

1. Allocated samples to five regions in California to account for any geographic differences. Samples were apportioned to regions based on population (see Figure 1 and Table 2).
2. Within each region, randomly selected sites based on site selection criteria and methods approved by CIWMB staff and the RRAC (see original Method Paper II for details).
3. Sorted waste in July/August 1995 and January/February 1996.
4. Calculated average percent of RPPCs by weight in disposed MSW (see page 5 for calculation method).
5. Multiplied RPPC percent of disposed MSW in 1995 by total 1995 California disposed MSW (see page 7 for calculations).

Table 1

Samples Sorted by Substream and Sorting Period

Substream	Sort 1 [1]	Sort 2 [2]	Total
Residential	114	159	**273**
Commercial	166	158	**324**
Self-Haul	125	167	**292**
Total	**405**	**484**	**889**

[1] July and August 1995

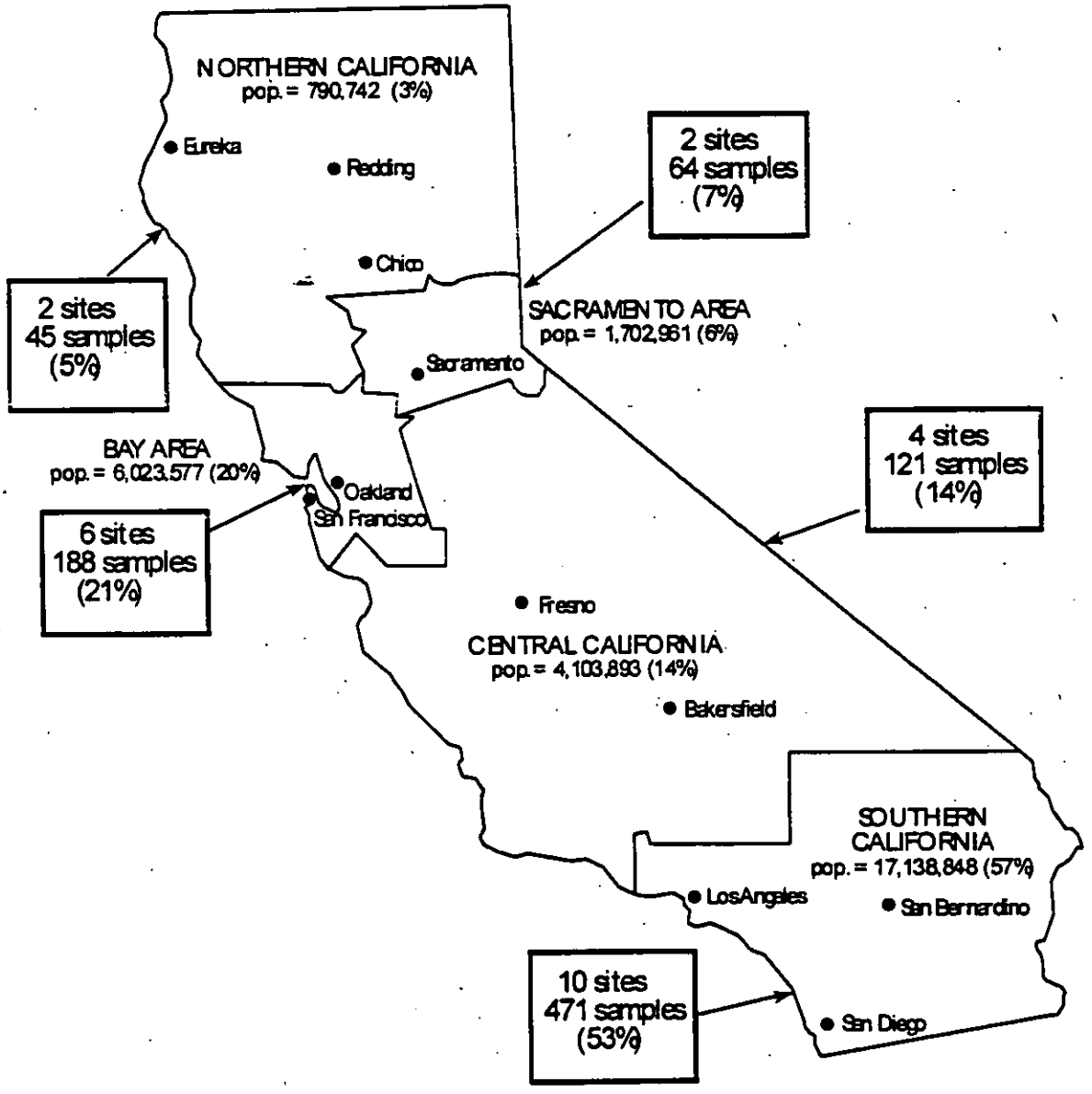
[2] January and February 1996

Substream Definitions:

- **Residential** - Waste collected by private, franchised, contracted, or public haulers that is generated by single-family residences, apartment buildings, condominiums and/or mobile homes.
- **Commercial** - Waste collected by private, franchised, contracted, or public haulers that is generated by businesses, industry, government and institutions.
- **Self-Haul** - Waste from residential, commercial, institutional, and/or industrial generators that is transported to a transfer station or disposal site by any vehicle other than privately- or publicly-owned vehicles engaged in providing waste collection services.

Figure 1

Samples Sorted by Region



Total = 889 sorts at 24 sites

Table 2

Jurisdictions/Areas Included in the Sampling

Load Origin	Number of Samples	Percent of Total	Load Origin	Number of Samples	Percent of Total
Alameda	2	0.2%	Crescent Park	1	0.1%
Albany	1	0.1%	Delano	1	0.1%
Alhambra	27	3.0%	Desert Hot Springs	11	1.2%
Angles Oak	1	0.1%	Eagle Rock	1	0.1%
Arcadia	7	0.8%	Earlimont	1	0.1%
Azusa	1	0.1%	East Highlands	1	0.1%
Bakersfield	3	0.3%	El Cerrito	1	0.1%
Baldwin Point	2	0.2%	Elsa Brena	1	0.1%
Bere Park	1	0.1%	Empire	1	0.1%
Berkeley	44	4.9%	Encino	1	0.1%
Bermuda Dunes	2	0.2%	Exeter	1	0.1%
Bernice	2	0.2%	Fair Oak	1	0.1%
Beverly Hills	1	0.1%	Fairfield	13	1.5%
Bonita	1	0.1%	Filmore	10	1.1%
Brentwood	1	0.1%	Glendora	2	0.2%
Briggs	1	0.1%	Hayward	6	0.7%
Brisbane	4	0.4%	Hercules	2	0.2%
Burbank	1	0.1%	Hesperia	56	6.3%
Burlingame	2	0.2%	Highlands	6	0.7%
Butte County	2	0.2%	Hilltop	2	0.2%
Button Willow	1	0.1%	Hollywood	3	0.3%
Calavasas	1	0.1%	Imperial Beach	1	0.1%
Camarillo	3	0.3%	Indian Wells	2	0.2%
Carmichael	1	0.1%	Indio	16	1.8%
Carpinteria	1	0.1%	Irwin	1	0.1%
Castro Valley	2	0.2%	Irwindale	1	0.1%
Cathedral City	11	1.2%	Kern County	2	0.2%
Cato City	1	0.1%	La Quinta	3	0.3%
Centerville	1	0.1%	Lake Cavilla	1	0.1%
Ceres	1	0.1%	Lemon Grove	4	0.4%
Chico	14	1.6%	Loma Linda	7	0.8%
Chula Vista	25	2.8%	Los Angeles	10	1.1%
Coachella	6	0.7%	McClelland	2	0.2%
Colton	3	0.3%	Mentone	6	0.7%
Concord	5	0.6%	Millbrae	7	0.8%
Contra Costa	3	0.3%	Modesto	31	3.5%
Coronado	3	0.3%	Monrovia	7	0.8%

Table 2, continued

Jurisdictions/Areas Included in the Sampling

Load Origin	Number of Samples	Percent of Total	Load Origin	Number of Samples	Percent of Total
National City	9	1.0%	San Mateo	2	0.2%
Northridge	5	0.6%	San Pablo	2	0.2%
Oakdale	3	0.3%	Santa Paula	23	2.6%
Oakland	6	0.7%	Saticoy	1	0.1%
Oakley	1	0.1%	Serene Lakes	1	0.1%
Oildale	4	0.4%	Shaffer	4	0.4%
Ojai	5	0.6%	Shoreline	1	0.1%
Oroville	3	0.3%	South Bay	1	0.1%
Oxnard	22	2.5%	Spring Valley	6	0.7%
Palm Desert	12	1.3%	Springfield	2	0.2%
Palm Springs	32	3.6%	Stanislaus County	2	0.2%
Paradise	4	0.4%	Suisun	3	0.3%
Pasadena	3	0.3%	Sun Valley	1	0.1%
Patton	1	0.1%	Sunland	1	0.1%
Pinal	1	0.1%	Sunnyvale	1	0.1%
Pittsburg	3	0.3%	Tahoe	4	0.4%
Pixley	1	0.1%	Terra Bella	1	0.1%
Placer County	12	1.3%	Travis	2	0.2%
Port Huenerne	1	0.1%	Truckee	22	2.5%
Porterville	28	3.1%	Tulare County	7	0.8%
Pt. Mugu	2	0.2%	Van Nuys	1	0.1%
Rancho Mirage	2	0.2%	Ventura	12	1.3%
Redding	20	2.2%	Wasco	4	0.4%
Redlands	12	1.3%	West Corina	1	0.1%
Richmond	14	1.6%	Westboro	3	0.3%
Rio Linda	6	0.7%	Whittier	28	3.1%
Riverside	1	0.1%	Yucaipa	14	1.6%
Rosedale	1	0.1%	*not reported*	6	0.7%
Sacramento	15	1.7%			
Salinas	20	2.2%	**Total Count**	**889**	**100.0%**
San Bernardino	8	0.9%			
San Bruno	2	0.2%	**Jurisdictions/Areas Represented**	**138**	
San Diego	10	1.1%			
San Fernando Valley	5	0.6%			
San Francisco	39	4.4%			
San Leandro	8	0.9%			
San Lorenzo	1	0.1%			

Calculation of Percent of RPPCs in California's Disposed Waste Stream (1995)

Step 1: Calculate ratio: $\frac{\text{AverageField}_{(lbs)}}{\text{AverageWaste}_{(lbs)}} = A$ (dirty field percent) for each type of RPPC, substream and site.

Step 2: Calculate ratio: $\frac{\text{AverageClean}_{(lbs)}}{\text{AverageField}_{(lbs)}} = E$ (contamination percent) for each type of RPPC, substream and site.

Step 3: Multiply $A * E = \frac{\text{Clean}_{(lbs)}}{\text{Waste}_{(lbs)}}$ (clean RPPC percent) for each type of RPPC, substream and site.

Step 4: Sum the clean RPPC percents from Step 3: $\sum \frac{\text{Clean}_{(lbs)}}{\text{Waste}_{(lbs)}} = H$ for each substream and site.

Step 5: Average the RPPC percents for each substream from Step 4 across 24 sites: $\frac{\sum H}{24 \text{sites}} = N$ for each substream. (See Table 3.)

Step 6: Weight the percents calculated in Step 5 by California's MSW substream percents (see Table 4) and calculate weighted average percent of RPPCs.

$(N_{RES} * MSW_{RES}) + (N_{COM} * MSW_{COM}) + (N_{SH} * MSW_{SH}) = \text{RPPC percent of MSW}$

Waste – weight of all sampled materials (RPPC weight plus nonRPPC weight)

Field – weight of sampled RPPCs (by component) at the disposal site

Clean – weight of each sampled RPPC (by component) after decontamination

Table 3

RPPC Percent (by weight) of Total MSW by Substream

Substream		RPPC Percent (N for each substream)
Residential	(N_{RES})	1.05%
Commercial	(N_{COM})	0.71%
Self-Haul	(N_{SH})	0.27%

Table 4

Percent of Disposed MSW by Substream (1995) [3]

Substream		Percent of Total (State %)
Residential	(MSW_{RES})	**27.8%**
Commercial	(MSW_{COM})	**51.0%**
Self-Haul	(MSW_{SH})	**21.2%**
Total		**100%**

[3] Based on disposed tons by substream for all sort sites having substream data (see Attachment I).

Calculation of RPPC percent of total MSW stream:

$(N_{RES} * MSW_{RES}) + (N_{COM} * MSW_{COM}) + (N_{SH} * MSW_{SH})$ = RPPC percent of MSW

(1.05% * 27.8%) + (0.71% * 51.0%) + (0.27% * 21.2%) = **0.71 %**

(± **0.05** % at 90% confidence level)

Calculation of tons of RPPCs in California 1995 MSW stream:

0.71% * 32,700,052 tons[4] = 232,170 **tons** or **464.3 million pounds**

Low estimate of tons disposed = 0.66 % * 32,700,052 tons or 215,820.3 tons (431.6 m lbs)

High estimate of tons disposed = 0.76 % * 32,700,052 tons or 248,520.4 tons (497.0 m lbs)

[4] Based on Board of Equalization disposal figure of 33,509,083 tons, less 809,031 tons disposed in non-MSW landfills that handle inert, green, wood, or other special wastes only.

Table 5

Percent of RPPCs Disposed (by Weight) in California (1995)
(by resin and container type)

Material	Percent of Disposed MSW
#1 PET Soda Bottles	0.068%
#1 PET Custom Bottles	0.092%
#1 PET Non-bottle Rigids	0.009%
#2 HDPE Natural Bottles	0.186%
#2 HDPE Colored Bottles	0.178%
#2 HDPE Other Containers	0.109%
#3 PVC Bottles	0.013%
#3 PVC Containers	0.002%
#4 LDPE Bottles	0.002%
#4 LDPE Containers	0.000%
#5 PP Bottles	0.005%
#5 PP Containers	0.011%
#6 PS Bottles	0.000%
#6 PS Rigids	0.007%
#6 PS Foam	0.001%
#7 Other Containers	0.006%
Multi-Resin Containers	0.000%
Un-Coded Containers	0.022%
Other RPPCs	0.000%
All RPPCs	**0.711%**

Attachment I: Reported Tons by Substream (1995)

(for 21 of the 24 sort sites) [1]

Facility	County	Commercial		Residential		SelfHaul		Total
Ballard Landfill	Ventura	190,242	52.0%	98,780	27.0%	76,829	21.0%	365,850
Berkeley Solid WasteTransfer Station	Alameda	21,736	28.9%	39,303	52.2%	14,260	18.9%	75,299
Blue Line Transfer, Inc.	San Mateo	58,676	46.2%	52,156	41.1%	16,168	12.7%	127,000
Coachella Valley Landfill	Riverside	116,671	77.3%	19,018	12.6%	15,244	10.1%	150,933
West Contra Costa Landfill	Contra Costa	178,469	49.5%	161,163	44.7%	20,911	5.8%	360,543
Davis Street Transfer Station/ Resource Recovery Complex	Alameda	305,335	39.6%	218,550	28.3%	247,575	32.1%	771,460
Edom Hill Landfill	Riverside	113,980	66.2%	31,680	18.4%	26,515	15.4%	172,175
Gilton Resource Recovery/ Transfer Facility	Stanislaus	48,600	32.8%	51,480	34.8%	47,880	32.4%	147,960
Neal Road Landfill	Butte	55,792	32.2%	103,267	59.6%	14,208	8.2%	173,267
North Area Transfer Station	Sacramento	39,352	38.1%	27,117	26.2%	36,861	35.7%	103,330
Otay Annex Landfill	San Diego	176,312	56.9%	83,353	26.9%	50,198	16.2%	309,863
Potrero Hills Sanitary Landfill	Solano	65,453	39.4%	62,621	37.7%	38,181	23.0%	166,255
Redding Transfer Station	Shasta	34,400	52.5%	14,337	21.9%	16,733	25.6%	65,470
San Timoteo Solid Waste Disposal Site	San Bernardino	56,620	46.5%	49,193	40.4%	15,951	13.1%	121,764
Salinas Disposal, Transfer & Recycling	Monterey	61,725	54.0%	33,237	29.1%	19,240	16.8%	114,202
San Francisco Solid Waste Transfer and Recycling Center	San Francisco	392,748	60.5%	190,000	29.3%	66,252	10.2%	649,000
Shafter-Wasco SanitaryLandfill	Kern	12,356	15.1%	40,342	49.3%	29,186	35.6%	81,884
Bradley Avenue West SanitaryLandfill	Los Angeles	498,928	63.4%	30,479	3.9%	257,024	32.7%	786,431
Teapot Dome Landfill	Tulare	25,814	41.5%	15,374	24.7%	20,944	33.7%	62,132
Eastern Regional MRF/Transfer Station	Placer	21,894	47.0%	19,565	42.0%	5,124	11.0%	46,583
Toland Road SanitaryLandfill	Ventura	15,742	44.8%	16,796	47.8%	2,635	7.5%	35,138
OVERALL TONNAGE		**2,490,845**		**1,357,810**		**1,037,919**		**4,886,539**
OVERALL PERCENTAGE			**51.0%**		**27.8%**		**21.2%**	

[1] Note: 'Azusa Land Reclamation Company, Inc.', 'Hesperia Refuse Disposal Site', and 'City of Whittier - Savage Canyon Landfill' not included due to lack of data.

Attachment I: Reported Tons by Substream (1995)

(for 21 of the 24 sort sites) [1]

Facility	County	Commercial		Residential		SelfHaul		Total
Bailard Landfill	Ventura	190,242	52.0%	98,780	27.0%	76,829	21.0%	365,850
Berkeley Solid WasteTransfer Station	Alameda	21,736	28.9%	39,303	52.2%	14,260	18.9%	75,299
Blue Line Transfer, Inc.	San Mateo	58,676	46.2%	52,156	41.1%	16,168	12.7%	127,000
Coachella Valley Landfill	Riverside	116,671	77.3%	19,018	12.6%	15,244	10.1%	150,933
West Contra Costa Landfill	Contra Costa	178,469	49.5%	161,163	44.7%	20,911	5.8%	360,543
Davis Street Transfer Station/ Resource Recovery Complex	Alameda	305,335	39.6%	218,550	28.3%	247,575	32.1%	771,460
Edom Hill Landfill	Riverside	113,980	66.2%	31,680	18.4%	26,515	15.4%	172,175
Gilton Resource Recovery/ Transfer Facility	Stanislaus	48,600	32.8%	51,480	34.8%	47,880	32.4%	147,960
Neal Road Landfill	Butte	55,792	32.2%	103,267	59.6%	14,208	8.2%	173,267
North Area Transfer Station	Sacramento	39,352	38.1%	27,117	26.2%	36,861	35.7%	103,330
Otay Annex Landfill	San Diego	176,312	56.9%	83,353	26.9%	50,198	16.2%	309,863
Potrero Hills Sanitary Landfill	Solano	65,453	39.4%	62,621	37.7%	38,181	23.0%	166,255
Redding Transfer Station	Shasta	34,400	52.5%	14,337	21.9%	16,733	25.6%	65,470
San Timoteo Solid Waste Disposal Site	San Bernardino	56,620	46.5%	49,193	40.4%	15,951	13.1%	121,764
Salinas Disposal, Transfer & Recycling	Monterey	61,725	54.0%	33,237	29.1%	19,240	16.8%	114,202
San Francisco Solid Waste Transfer and Recycling Center	San Francisco	392,748	60.5%	190,000	29.3%	66,252	10.2%	649,000
Shafter-Wasco SanitaryLandfill	Kern	12,356	15.1%	40,342	49.3%	29,186	35.6%	81,884
Bradley Avenue West SanitaryLandfill	Los Angeles	498,928	63.4%	30,479	3.9%	257,024	32.7%	786,431
Teapot Dome Landfill	Tulare	25,814	41.5%	15,374	24.7%	20,944	33.7%	62,132
Eastern Regional MRF/Transfer Station	Placer	21,894	47.0%	19,565	42.0%	5,124	11.0%	46,583
Toland Road SanitaryLandfill	Ventura	15,742	44.8%	16,796	47.8%	2,635	7.5%	35,138
OVERALL TONNAGE		**2,490,845**		**1,357,810**		**1,037,919**		**4,886,539**
OVERALL PERCENTAGE			**51.0%**		**27.8%**		**21.2%**	

[1] Note: 'Azusa Land Reclamation Company, Inc.', 'Hesperia Refuse Disposal Site', and 'City of Whittier - Savage Canyon Landfill' not included due to lack of data.

MSW Substream Benchmarking

1) Self Haul as Percent of Disposed MSW:

Jurisdiction	Percent Disposed
State of Washington ('92)	25%
State of Oregon (non-metro '93)	27%
Seattle, WA ('95)	20%
State of California ('95)	**21%**

MSW Substream Benchmarking

2) Residential Per Capita Disposal:

Jurisdiction	tons/capita/year
State of Washington ('92)	0.31
State of Oregon ('93)	0.28
Seattle, WA ('95)	0.27
State of California ('95)	**0.28**

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MSW Substream Benchmarking

3) Total Per Capita Disposal:

Jurisdiction	tons/capita/year
State of Washington ('92)	0.79
State of Oregon ('93)	0.80
Seattle, WA ('95)	0.80
State of California ('95)	**1.01**

RPPC Composition Benchmarking

Disposal:

Packaging Type	Oregon *(93) pounds/capita/year	California (95) pounds/capita/year
PET	1.7	3.2
HDPE	10.6	9.6
Other	3.7	1.6
Total	**16.0**	**14.4**

* Oregon RPC definition includes non-resealable containers and packaging designed for food storage of less than seven days.

Comparison of Waste Generation Estimation Methods

(Rigid Plastic Packaging in Oregon and California)

	Waste Composition	National Data	Waste Comp ÷ National Data
Oregon ('93)	62.6 m lbs *	88.8 m lbs	70%
California ('95)	620.7 m lbs	842.6 m lbs	74%

* For all Oregon RPCs, which include a broader range of packaging types than the California definition of RPPCs.

Table 5

Percent of RPPCs Disposed (by Weight) in California (1995) (by resin and container type)

Material	Percent of Disposed MSW
#1 PET Soda Bottles	0.068%
#1 PET Custom Bottles	0.092%
#1 PET Non-bottle Rigids	0.009%
#2 HDPE Natural Bottles	0.186%
#2 HDPE Colored Bottles	0.178%
#2 HDPE Other Containers	0.109%
#3 PVC Bottles	0.013%
#3 PVC Containers	0.002%
#4 LDPE Bottles	0.002%
#4 LDPE Containers	0.000%
#5 PP Bottles	0.005%
#5 PP Containers	0.011%
#6 PS Bottles	0.000%
#6 PS Rigids	0.007%
#6 PS Foam	0.001%
#7 Other Containers	0.006%
Multi-resin Containers	0.000%
Un-Coded Containers	0.022%
Other RPPCs	0.000%
All RPPCs	0.711%

ALTERNATIVE CALCULATION METHODOLOGY: ALL-CONTAINER RECYCLING RATE DENOMINATOR USING NATIONAL SALES DATA AND RECYCLING RATE ADVISORY COMMITTEE COMMENTS

One approach to estimate the denominator of the all-container recycling rate (the tons of RPPCs generated) is by integrating statistics from the following two data sets:

* California Department of Conservation (DOC) , California Redemption Value (CRV) plastic soda beverage containers, and

* National resin sales data published in Modern Plastics Periodical.

The DOC tracks the number of CRV plastic soda beverage containers sold in California. Statistics are maintained and published by container count in DOC's "Report of Redemption and Recycling Rates". Year-end summaries of sales and recycling are published in June of the following year. Information from DOC provides the number of tons of plastic soda beverage containers sold in California during 1995.

National resin sales are published annually in the January edition of Modern Plastics, a magazine published by McGraw-Hill. Data collection methodology is established by the Society of Plastic Industries (SPI) and the survey is developed and conducted by the firm Ernst & Young. To have year-end totals prepared for the January publication, fourth quarter sales are based on projections. These projections are adjusted in the following year's edition. Thus, the January 1996 issue included sales for 1995 (incorporating a projected fourth quarter) and the adjusted sales for 1995.

Sellers of resin report monthly sales in the following ways (units are millions of pounds): by resin type; by amount sold for various applications, within a resin type and by the amount sold in major resin markets including packaging and containers. Monthly sales reported by each company are cross checked with the company's sales for the previous month and with sales for the same month, one year prior. Totals are not adjusted for non-reporting resin sellers.

The packaging and container statistics assembled by Modern Plastics identify the amount of each resin type sold for producing containers, closures, coatings, and films. Estimates of RPPC generation will be obtained by performing a line item summation of all resin applications (excluding PETE soft-drink bottles) that fall within the RPPC definition. (DOC data will be used for the PETE soft-drink generation data.) Table 1 presents the generation categories by resin type and category used by Modern Plastics in the 1992. The 1992 table is presented as

resin statistics were disaggregated in greater detail in 1992 than are available currently.

Table 1
Modern Plastics
Category of Resin
1992

RESIN TYPE/CATEGORY

PETE
- Custom containers

HDPE
- Liquid food
- Household chemicals
- Motor oil
- Pharmaceutical, cosmetics
- Drums
- Tight head pails
- Other blow molding
- Pails
- Dairy tubs
- Ice cream containers
- Beverage bottle bases
- Other food containers
- Paint cans

Because

LDPE
- Blow molding

PP
- Consumer packaging
- Containers
- Other injection moldings

PS
- Rigid packaging
- Dairy containers
- Vending and Portion Cups
- Egg Cartons
- Hinged Containers
- Cups (non-thermoformed)
- Cups and Containers (expanded bead PS)

PVC
- Blow molding bottles

Other Resins
- Acrylonitrile Butadiene Styrene
- Cellulosics, Polycarbonate
- Styrene Acrylonitrile

Because the categories in Modern Plastics are not consistent over time, staff, using resin quantities from 1992, estimated some

resin sales for 1995. The categories available in Modern Plastics, the estimation procedure, and estimates of resin sales in California for 1995 are presented in Table 2.

Table 2
Modern Plastics
Category of Resin and Estimated Quantity
1995

RESIN TYPE/CATEGORY	U.S. Resin Sales Tons	CA. Resin Sales Tons
PETE		
Custom containers	440,000	50,530
DOC CRV soda bottles (Taken from DOC)		51,404
HDPE		
Liquid food bottles		
Household & industrial chemicals		
Motor oil		

Because the same categories were not available in 1995 as in 1992, a factor representing the percentage of RPPCs in the blow molding and injection molded categories were determined using 1992 data and applied to the total blow molding and injection molded categories for 1995.

Total Blow Molded	1,498,150	172,048
Total Injection Molding	555,500	63,794
LDPE		
Blow molding	34,000	3,905
PP		
Containers	84,000	9,647
Rigid packaging	534,500	61,382
Other molding	122,000	14,010

The three categories of Polypropylene in 1995 are different than those presented for 1992. The 1995 data also included sales to Canada.

PS		
Rigid packaging	52,500	6,029
Dairy containers	89,500	10,278
Vending and Portion Cups	155,000	17,800
Egg Cartons	30,500	3,503
Hinged Containers	59,000	6,776
Cups (non-thermoformed)	28,500	3,273
Cups and Containers (expanded bead PS)	89,500	10,278

PVC		
Blow molding bottles	86,500	9,934

The 1995 data for PVC includes sales to Canada.

Other Resins		
Acrylonitrile Butadiene Styrene		
Packaging	4,500	517
Cellulosics	n/a	

The category Cellulosics was not available in the 1995 Modern Plastics publication.

Polycarbonate		
Packaging	17,500	2,010

The 1995 data for polycarbonate includes sales to Canada.

Styrene Acrylonitrile	n/a	

The category Styrene Acrylonitrile was not available in the 1995 Modern Plastics publication.

	TOTAL	497,118 tons

The United States is a net exporter of resin and net importer of plastics products. ("Contribution of Plastics to the U.S. Economy", Society of Plastics Industry, Inc. 1992.) The amount of resin exported as RPPCs and the quantity of RPPCs imported into the U.S. is not known and can not be easily determined. Staff has assumed that resin produced in the U.S. and exported as RPPCs is equal to the amount of RPPCs imported.

The last step to estimate California generation of RPPCs is to prorate the nationwide resin sales to California. The scaling factor for this proration is calculated in Equation (1):

$$(1) \qquad CA\_Share = 0.5 \frac{CA\ pop}{US\ pop} + 0.5 \frac{CA\ RS}{US\ RS}$$

Where;

CA_Share = scaling factor to apportion US resin sales to California;

CA pop = California population;

US pop = U.S. population;

CA RS = dollar value of nondurable good retail sales in California; and

US RS = dollar value of nondurable good retail sales in the U.S.

The equation prorates national resin sales data to California using the indicators of population and economic activity. Both factors are weighted equally.

Equation (1) is evaluated using population data and U.S. Department of Commerce non-durable goods retail sales data for 1995.

$$CA\_Share = 0.5 \frac{32,344,000^{1}}{263,434,000^{3}} + 0.5 \frac{\$153,800^{2}}{\$1,406,952^{4}}$$

$$= 0.5(0.123) + 0.5(0.109)$$

$$CA\_Share = 0.116$$

CA_Share will be multiplied by the national resin sales, then multiplied by 0.99 to account for a 1 percent resin loss that occurs during the container manufacturing process. (Franklin Associates, 1992)

Resin generation volumes for all RPPC resin types identified in Table 2 above were prorated to California using the scaling factor in Equation (1) multiplied by the resin loss factor of 0.99. To this figure, the DOC CRV soda bottle sales data was added to estimate total RPPC sales in California.

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1 Conversation with analyst at the Department of Finance, Demographic Research Unit, April 22, 1996.

2 Conversation with analyst at the California Trade and Commerce Agency, Office of Economic Research, April 22, 1996. Data taken from U.S. Department of Commerce, Current Business Reports, ($million).

3 Conversation with analyst at the Department of Finance, Demographic Research Unit, April 22, 1996.

4 Conversation with analyst at the California Trade and Commerce Agency, Office of Economic Research, April 22, 1996. Data taken from U.S. Department of Commerce, Current Business Reports, ($million).

June 28, 1996

TO: Steve Storelli

FROM: Joan Edwards

RE: Alternate method for calculating pounds of plastic containers generated in 1995

I did not respond earlier to your request for comments on the alternate methodology for calculating diversion/disposal of rigid containers in California because I have been on record several times, in testimony before the CIWMB, in prior letters to staff and through my comments at RRAC meetings, as being in favor of a methodology which utilizes sales of rigid containers in order to obtain a generation figure.

However, in light of comments by APC members that they do not wish sales figures to be used, either in California or nationally, for calculations related to diversion/disposal, I believe it is important to reiterate my concerns. First, all other commodity types utilize national and regional production figures for their calculations of diversion rates. Second, the Department of Conservation, based on their years of experience, not only recommended that the CIWMB utilize this methodology, but also offered to assist in transferring their experience to a study of all rigid containers. Third, the information is available at a far lower cost than the cost of statewide waste sorts. Fourth, any weaknesses in this alternate methodology are clearly matched by the weaknesses in waste characterization studies - even those which use the Board's standard methodology. And the flaws in waste characterization approaches become magnified as the targets, either in type of generator or in material type, are more limited in scope. Finally, as plastics continue to grow as a percentage of the waste stream, so does the importance of an independent standard of measurement.

Industry publications and speakers at the CIWMB's own plastic markets workshop last year have noted the fact that production of virgin plastic products is outpacing recycling activity. I expect that any calculation done based on proration of national sales figures or using a California or Western Region sales data base will show results far different from the results which were achieved by the consultant and methodology commissioned by the plastic industry. This discrepancy, and other issues which have been raised time and again with the CIWMB, should give you some concern as you develop your report on rigid container diversion rates and recommendations to Boardmembers.

je231

TALCO

TALCO PLASTICS, INC.
11650 BURKE STREET
WHITTIER, CA 90606
TEL 310-699-0550
FAX 310-692-6008

June 25, 1996

Steve Storelli
CIWMB
8800 Cal Center Drive
Sacramento, CA 95826

Dear Steve:

Per Bill Huston's letter of June 18, 1996, CIWMB staff was directed to work with RRAC to develop an independent benchmark denominator for the RPPC recycling rate. A methodology developed by Board staff in 1994 was attached. Previously this formula was discussed at a public workshop on March 31, 1994.

Bill asked the members of the RRAC to comment on this methodology. I am submitting my answer in the following paragraphs.

I believe this method may be superior (more reliable) than the "waste characterization" sampling performed by Cascadia. Certainly we need to cross check the denominator just as we established benchmark cross checks for our numerator during the past few weeks. Based on the correlation, the RRAC unanimously accepted the numerator.

If the alternate denominator methodologies show reasonably close correlation (say within 10%), then I would accept the Cascadia figures. But if the spread is much more than 10%, and if the prorata national production data is higher, then I would ask the ungrammatic, enigmatic question "where has all the plastic went?"

Did we miss it by not counting all the plastic that litters the countryside, gets dumped in individual rural garbage sites, in the ocean, incinerator or ????

In this case I would not be in favor of accepting Cascadia figures and would lean towards accepting the factored national production data methodology.

Summing up my thoughts—if the Cascadia figures come within 10% of the alternate "production data" methodology, I would recommend accepting their report.

Sincerely,

John L. Shedd
President

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American
Plastics
Council.

June 25, 1996

Mr. Bill Huston, Senior Waste Management Specialist
California Integrated Waste Management Board
8800 Cal Center Drive
Sacramento, CA 95826

Subject: **Comments on Alternative Rate Calculation Using National Resin Sales Data from Modern Plastics**

Dear Mr. Huston:

At the June 18, 1996, Meeting of the Recycling Rate Advisory Committee (RRAC) meeting in Irvine, CA, you distributed a memorandum requesting comments on an alternative method to calculate the all-container recycling rate denominator. This alternative is based on use of statistics from the Department of Conservation (DOC), California Redemption Value (CRV), plastic soda bottle redemption reports and volumes of sales of resin reported annually in Modern Plastics, the plastics industry trade magazine.

Enclosed with this cover letter are comments prepared by Mr. Jonathan J. Burgiel of R.W. Beck. Mr. Burgiel is a recognized expert in plastic container recycling rates and has compiled information on national plastic recycling for a number of years. His work is on plastic recycling rates recognized as the most current and accurate national information available. Please accept my comments in conjunction with those of Mr. Burgiel. Other enclosures provide some historical perspective to the discussions and decisions that have occurred concerning the use of national resin sales as a basis for measuring plastic container generation in California. They are submitted in support of the points made in this comment letter.

The information generated by the DOC continues to be the most reliable data available for estimating the polyethylene terepthalate (PETE) soda bottle beverage containers sold in California each year. Accordingly, the DOC data on PETE has continued to play a key role in the development of a California specific methodology for calculation of the all-container rate. The

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methodology which includes use of DOC data was approved by the RRAC, the Local Assistance and Planning Committee (LAPC) and the California Integrated Waste Management Board (CIWMB).

The accuracy of DOC data, when combined with the assumptions for use of national resin sales in the alternative methodology, is unquestionably compromised. Utilization of California population, as a percentage of U.S. population and California resin sales, as a percentage of U.S. resin sales, will invariably lead to development of an inaccurate calculation of rigid plastic packaging container (RPPC) sales in California. It was this determination that led to the decision, as supported by the RRAC, LAPC and CIWMB, to perform a California specific study, based on actual data developed from waste characterization sorts, to determine the denominator for the all-container RPPC recycling rate.

Specific problems with reliance on extrapolated national resin sales are summarized as follows:

Modern Plastics Data Overestimates RPPC Generation

It has been clearly established that most categories of resins tracked by Modern Plastics end up in uses other than rigid plastic packaging containers (RPPCs). The percentage or volume cannot be determined because no record exists for all end uses of resins purchased. What is certain is that any volume of resin attributed to RPPCs that does not end up in that use, translates directly into an overestimation of RPPC generation on a pound for pound basis. Please reference the correspondence enclosed, dated April 19, 1994, when use of the pro-rated national sales data was first considered and dismissed.

Modern Plastics Data Does Not Address Regional Variations

Pro-rating national data to California assumes consistent distribution of container use on a national level. This has consistently been proven to be a wrong assumption. Very accurate information on the balance of use of aluminum beverage containers and PETE soda bottles in California is

compiled by the DOC. This information confirms that per capital use of PETE soda bottles is less in California than in the nation. Use of pro-rated national sales data on a population and resin sales basis will result in verifiable overestimation of RPPC generation.

Foreign Sales Dilute The Accuracy Of Modern Plastics Sales Data

Although it is impossible to make adjustments for the exact amount, there is clear evidence that resin sales are made to Canada and Mexico. The staff of the CIWMB makes the assumption that imports of products offset exports of resin, to a neutral value. Unless this assumption can be validated, the amount of resin sold could result in a significant overestimation of RPPC generation. Transportation costs and regional manufacturing efficiencies favor utilization of U.S. produced packaging over imported goods.

Modern Plastics Data Is Based On Estimates As Much As Survey Data

Based on the findings of R.W. Beck, information contributed to the Modern Plastics reporting system is derived in major part from information provided by resin producer representatives and industry consultants, not actual surveys of companies. The estimates utilized to project the last quarter of each calendar year raise further questions about the accuracy of the information to calculate alternative formulae for RPPCs.

A process has been established to perform the most accurate possible estimation of the generation of RPPCs in California. This process is based on actual measurement of RPPCs in the waste stream in this state. For the purpose of fulfillment of the mandate of the CIWMB to measure the recycling rate for RPPCs in California for 1995, the most detailed and accurate information on this subject ever assembled is available as a result of the joint effort of the CIWMB and the American Plastics Council, with input from the RRAC. To confuse the process chosen with alternative methodologies does a disservice to the deliberate process selected. The CIWMB will have ample opportunity to develop alternative methodologies for future calculations, based on more concrete assumptions learned out of the scientific process applied for determination of the 1995 recycling rate.

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The APC finds insertion of alternatives to the process chosen unacceptable in principal, as well as for the reasons noted in this comment letter. Please feel free to call me if I can provide further information or respond to any questions.

Sincerely,

Laurie Hansen
Director Government Affairs, Western Region

cc: Roger Bernstein, Senior Director, Government Affairs Regional Operations

Enclosures: R.W. Beck comment letter to Laurie Hansen, dated June 24, 1996
APC letter to Bill Huston, CIWMB, dated April 19, 1994
APC letter to Steve Storelli, CIWMB, dated May 30, 1995

June 24, 1996

R·W·BECK

Ms. Laurie Hansen
Director, Government Affairs
Western Region
American Plastics Council
1121 L. Street, Suite 910
Sacramento, CA 95814

Subject: **Modern Plastics Resin Sales Data**

Dear Laurie:

As you requested, we have detailed in the paragraphs below R. W. Beck's five main concerns with using Modern Plastics data to determine RPPC generation in California.

Inclusion of Resin Sales to Canada

Modern Plastics figures include resin sales to Canada for the following resin types:

- Thermoplastic Polyester (PET),
- Polyvinyl Chloride (PVC),
- Polypropylene (PP),
- Acrylonitrile Butadiene Styrene (ABS),
- Styrene Acrylonitrile (SAN),
- SB latex,
- Other styrenics,
- Nylon *(also includes sales to Mexico)*,
- Engineering Resins.

Several of the resin types shown above contain RPPC's. Modern Plastics has made the transition to reporting U.S./Canada resin sales combined in order to be consistent with data produced by the Society of the Plastic Industries' (SPI) Committee on Resin Statistics (CRS). These same categories are released as combined U.S./Canadian resin sales by the CRS.

Due to these virgin resin sales to Canada and domestic resin sales used for the production of bottles and containers that are eventually sold and consumed in Canada, prorating Modern Plastics' resins sales data to California based on U.S. population will likely overestimate RPPC generation.

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800 North Magnolia Avenue, Suite 300 Orlando, FL 32803-3274 P.O. Box 538817 Orlando, FL 32853-8817
Phone (407) 422-4911 Fax (407) 648-8382

Three Quarters Actual, One Quarter Estimated

In order to prepare year-end resin sales data for their January issue, Modern Plastics uses actual CRS resin sales data through September and estimated/projected resin sales data for the last quarter of the calendar year. Estimated data for the last quarter is developed based on the trend in resin sales for the first three quarters, and overall industry estimates provided by resin producer representatives and consultants.

Reportedly, Modern Plastics revises the data released for the previous year to reflect actual CRS resin sales data for the last quarter of that calendar year. Therefore, Modern Plastics data for calendar year 1995 would not accurately reflect CRS data until the January, 1997 issue. However, R. W. Beck has found several instances where Modern Plastics data were not revised to correspond with the finalized CRS data.

Packaging Mix

Modern Plastics national resin sales data should not be used as a proxy for California specific generation or product sales data. Due to imports and exports of RPPCs, regional variations in consumption patterns, and variations in the types of packaging used by manufacturers in regional markets (plastics, glass, aluminum, etc.), national resin sales data may not accurately reflect the amount of RPPC's sold or generated in California.

For example, in performing the 1994 Florida Plastic Bottle Recycling Rate Study, R. W. Beck determined that Florida generated an above average amount of plastic bottles due to sales of store-brand citrus juice products in natural HDPE bottles. In other states, the majority of sales for citrus juice products were packaged in a concentrated can.

Industry Estimates

The sole basis for Modern Plastics data is not the CRS resin sales data. Modern Plastics produces data that is not released by CRS due to disclosure considerations. For example, resin sales data for PET bottles is not released by the CRS, however Modern Plastics produces PET bottle resin sales data. Modern Plastics also produces market data in greater detail than the CRS data (i.e., they break the resin sales data out into more categories than does the CRS).

Based on conversations R. W. Beck has had with Modern Plastics, it is our understanding that this data is derived based on estimates provided by individual representatives of resin producers and various consultant estimates for a particular market - not a comprehensive survey of companies selling resin into a particular market (as is performed to develop the CRS data).

Definition of an RPPC

Modern Plastics categories are not consistent with the regulatory definition of an RPPC. Many Modern Plastics categories appear to be RPPC categories, however actually include products that do not fit the RPPC definition. For example, the blow molded HDPE category includes automobile gas tanks. While the total contribution of these types of materials may be small for each category, the overall effect is to over-estimate total RPPC generation.

Laurie, I hope this information gives you a better understanding of the Modern Plastics resin sales data. If you should have any questions during your review, please feel free to call me at (407) 648-3586.

Sincerely,

R. W. BECK, INC.

Jonathan J. Burgiel
Associate and Director,
Environmental Services

cc: Jean Vallianos, CRS
Ron Perkins, APC
Charlie Scott, Cascadia Consulting Group
Chuck McLendon, R. W. Beck

American
Plastics
Council

April 19, 1994

Mr. Bill Houston
Markets Development Manager
California Integrated Waste Management Board
8800 Cal Center Drive
Sacramento, California 95826

Mr. Steven Storelli
Resource Economist
California Integrated Waste Management Board
8800 Cal Center Drive
Sacramento, Califronia 95826

Dear Bill and Steve:

At the March 31 California Integrated Waste Management Board workshop on a proposed methodology to calculate the rigid plastic packaging container (RPPC) recycling rate you outlined the Board's short-term methodology to calculate the denominator of the recycling rate calculation to include statistics from two data sets:

- DOC, California Redemption Value (CRV) plastic soda beverage containers; and
- National resin sales data published in Modern Plastics.

At the meeting, we indicated our support of the DOC CRV data as you proposed. However, we suggested that the Modern Plastics categories you presented in Table 2 on pages 10 and 11 of the Proposed Methodology Memorandum should be modified. We stated our comments were based on our understanding of the Society of the Plastics Industry's resin manufacturers' reporting of annual resin sales upon which Modern Plastics statistics are generated.

Based on our understanding, we commented that most of the categories you presented in Table 2 include items that we could all agree are RPPCs. We also commented that within these same categories are some items that we could all agree are not RPPCs. Additionally, we commented that a few of the categories in Table 2 should be entirely eliminated as it is highly unlikely that any of the items in the categories are RPPCs. To illustrate our point, we cited examples under the 3 categories (*Consumer Packaging, Containers, Other Injection Molding*) you listed on page 10 under Polypropylene (PP). For instance, to the best of our knowledge *Consumer Packaging* and *Containers* include RPPCs such as margarine tubs, whipped topping tubs, yogurt cups, ketchup bottles, syrup bottles, water and juice bottles, and shampoo bottles as well as non-RPPCs such as blister packs, dispenser pumps for toothpaste, baby bottles and automotive

fluid reservoirs. The category, *Other Injection Molding*, most likely includes all non-RPPCs such as components for industrial, building/construction and electrical applications such as computers and business machines, pipe fittings, textile cones and industrial totes. Inclusion of these categories in the recycling rate equation will overstate the denominator and result in a misleading decrease in the overall RPPC recycling rate.

Following our comments you graciously asked that we get back to you with further comments on each of the categories you have identified on pages 10 and 11 of the Proposed Methodology Memorandum. We thank you for this opportunity and offer the following information.

Under High Density Polyethylene (HDPE) we believe most of the categories you have listed include RPPCs, although some of the categories are likely to include non-RPPCs as well. For example, food storage containers (e.g., tupperware containers) are most likely reported in Modern Plastics under the category labeled as *Other Food Containers*. While tupperware is a container, it is not an item covered by California's RPPC law. Additionally, the categories you identified as *Other Blow Molding* and *Other Injection Molding* should be eliminated in their entirety because it is highly unlikely that any of the resin sold in these categories are used to produce RPPCs. To the best of our knowledge, these categories include items other than bottles and containers which have already been itemized in Modern Plastics. *Other Blow Molding* and *Other Injection Molding* most likely include toys, auto air ducts and other applications not generally viewed as RPPCs.

Products reported in the category Low Density Polyethylene (LDPE) *Blow Molding* include bottles to contain a variety of products, such as juice, mustard, honey, and eye drops—all common RPPCs. However, LDPE is also blow molded to produce toys, novelties and other non-RPPC products which also may be reported in this category.

The categories you have listed for Polystyrene (PS) on page 11 include common RPPCs. However, several of the categories include non-RPPCs as well. For instance, *Rigid Packaging* probably includes common RPPCs such as bottles, condiment containers and dairy containers. This category also likely includes cases, closures, mugs and carafes which are not RPPCs.

Polyvinyl Chloride (PVC) is primarily used to manufacture non-RPPC products. Common uses of PVC non-RPPCs include flooring, coatings for industrial use, adhesives, wire and cable, residential and non-residential siding, and pipe and tubing. PVC sales reported in Modern Plastics under *Blow Molding Bottles*, however, most likely should be considered RPPCs.

Acrylonitrile-Butadiene-Styrene (ABS) is most often used to produce non-RPPC products such as toys and sporting goods, health care and medical products and food serviceware such as picnic items. It is unclear if any of the items reported under ABS are RPPCs.

Cellulosics is used in a variety of applications including tool handles, eyeglasses and some packaging of electronic parts, nuts and bolts and tacks. We

have no way of knowing what portion if any of the *Packaging* category identified in Modern Plastics is sold to manufacture RPPCs.

Polycarbonate (PC) is a key player in the automotive, business machine and appliance markets. However, some amount of PC resin sold is used for food contact applications such as 5-gallon water bottles, microwave ovenware, beer mugs and pitchers, tableware, and food storage containers. Of the categories identified in Modern Plastics it is likely that only a small, but undetermined portion of the *Packaging* category should be included in Table 2 to account for the 5-gallon water bottles.

Most Styrene-Acrylonitrile (SAN) is used to manufacture products in the electrical and electronic, building and construction and transportation fields. SAN is also used to produce products for personal, house and garden or institutional uses including disposable food serviceware, health care and medical products, toys, and sporting goods. It is unclear whether any of these items are RPPCs.

In closing, inclusion of any non-RPPC items in the recycling rate equation will highly overstate the denominator and will result in a misleading decrease in the overall California RPPC recycling rate. For this reason, it is particularly important that you ensure that the categories you apply from Modern Plastics truly represent RPPCs as they are defined under California law. As you review the Modern Plastics categories keep in mind that items identified as *Bottles*, *Containers* and *Packaging* are not necessarily RPPCs.

We hope the information provided in this memorandum will assist you in your effort to refine the denominator of the recycling rate calculation. We look forward to talking with you further and hope that you will call us immediately if you have any questions about this information.

Sincerely,

Patricia A. Enneking
Director, Regulatory Issues
American Plastics Council

Laurie Hansen
Director, Government Affairs
Western Region
American Plastics Council

cc: Susan Collins, SCS Engineers
Steven Teslik, APC

Steven F. Teslik
Manager–Database

American Plastics Council

May 30, 1995

Stephen Storelli
CIWMB
Markets Development Branch
8800 Cal Center Drive
Sacramento, CA 95826

Steve:

Per your request, I am enclosing SPI's 1994 bottle resin sales and captive use data for PET and HDPE for your review.

This is the primary data that SPI releases to Modern Plastics in the month of December which is then subsequently published in Modern Plastics' January issue. As we have previously discussed, Modern Plastics converts many of the broad SPI resin categories listed in SPI's table into popular subcategories based on their knowledge and assumptions relative to markets. For instance, SPI's PET Bottle Grade data is reported as one figure due to disclosure constraints. Modern Plastics in turn is able to divide this figure into PET Soda, Custom, Ovenable Trays, and Other Packaging based on "knowledgeable industry sources." Also, further refinement of these figures to discount solid state or melt phase resin Bottle Grade resin sold into and out of Canada is extremely difficult.

To enable APC to more accurately establish the production through disposal path the virgin resin transverses I have put together a flow chart showing the major areas of bottle conversion and consumption. The primary purpose of this chart is to help APC and other stakeholders obtain a more realistic understanding of the pounds of plastic bottles available for recycling once all the gains and losses in these areas are accounted for. Consider the following (in order described by the flow chart):

• Bottle Resin Producer - This area is defined as the bottle grade virgin resin producers such as Eastman, Quantum, etc. This is the starting point of the virgin resin path and is quantified by their respective categories in the SPI data (e.g., PET Bottle Grade Resin). It cannot be assumed that all bottle resin produced finds its way to bottle makers. For instance, bottle resin is diverted into non-bottle applications (e.g., PET diverted to fiber markets and HDPE diverted to plastic bags) before it gets to the bottle convertor the amount of which is dependent on market forces.

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• Bottle Convertor - This is the point at which the resin is converted into a bottle. At this juncture a mass balance needs to be performed around the convertor to accurately assess the quantity of resin lost and gained during the bottle manufacturing process. There is a loss of resin due to: 1) manufacturing losses such as extruder screens and floor losses; 2) off-spec resin which is not compatible with machinery type or product function; 3) inventory buildup of material to offset resin price fluctuations; and 4) export of resin, preforms, and bottles to subsidiary bottle manufacturing facilities outside the United States. Similarly, there is a net gain of material to the bottle convertor from the incorporation of PCR material into a recycled content bottle.

• Filler - This area accounts for the loss of bottles during the addition of product to the bottle. Most of the items identified on the chart are related to the standard losses typical of a manufacturing operation including crushed, mislabeled, and half filled bottles. Of more significance are the bottles to be filled for export including Canada, South America, and Asia.

• Distribution - At this point the filled bottle is transported to the various sales points including grocery markets, convenience stores, etc. There are some losses due to unsold product, transportation mishandling, and again, export. There is also a probability of a small gain from import of product.

• Consumer - Finally there is the consumer who rather than immediately place their bottles in a recycling or disposal stream may chose to reuse, refill, store, or change the intended application of the bottle such that it no longer a candidate for recycling collection.

In summary, there are numerous points along the bottle resin path at which the bottle material is lost or compromised. Unfortunately, with each successive step in the bottle manufacturing, filling and distribution process, the number of entities representing a respective area grows exponentially and quantifying the pounds of resin used becomes more problematic until you get to the handlers of the disposed and recyclable materials. At this point there is once again a small identifiable group who's data can be well profiled.

I hope this is of some help in clarifying why the SPI data can be accurate for its intended application specific to marketing branch of the resin producers while at the same time be significantly incorrect in providing data on a state-by-state or actual tonnage basis. If there are any further questions please do not hesitate to call.

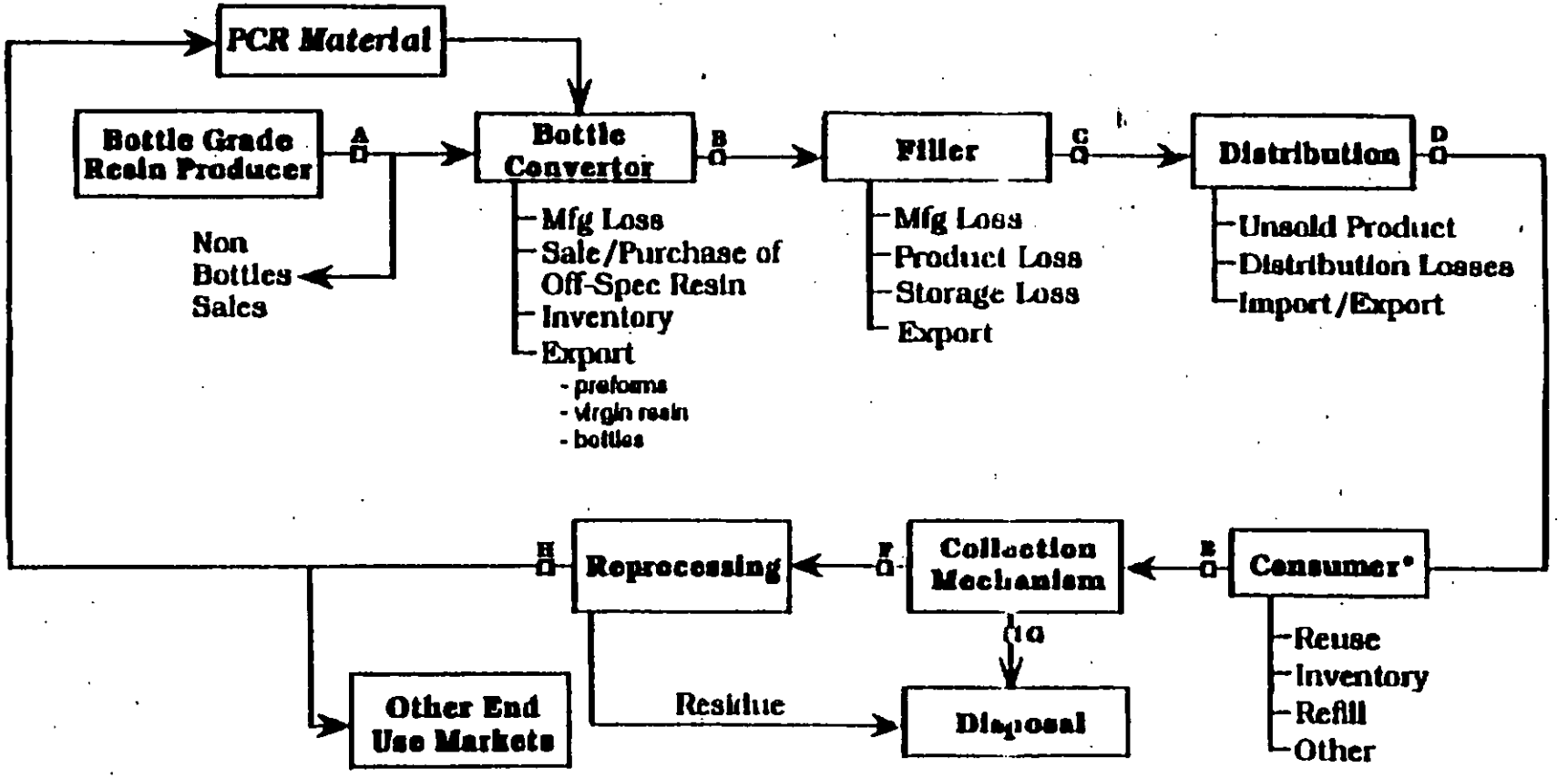
Sincerely,

Steven Teslik
Manager - Data Bases
American Plastics Council

cc: Roger Bernstein, APC
Laurie Hansen, APC
Ron Perkins, APC

Bottle Resin Flow Diagram

-Denominator Estimation Points-



*Consumers are:
- Residential (Primary)
- Commercial
- Industrial
- Institutional
- Export
- Other

D- Data collection point

USE OF "BENCHMARKS" TO ASSESS THE ACCURACY OF THE NUMERATOR AND DENOMINATOR

Various "benchmarks", using a wide variety of alternative methods, data, and comparisons, are presented in this Attachment. These comparisons indicate the tons of rigid plastic recycled and disposed as determined during the APC study are "within the ballpark" of these benchmarks.

NUMERATOR

Benchmark of RPPC Survey Results

Three independent surveys were conducted for collectors (Level A), handlers/processors (Level B), and reclaimers/exporters (Level C). The objective of the bench-marking was to test the relative magnitude of the survey results against approximations of PETE recovery and total RPPC recycling using independent secondary data sources.

Bench Mark 1: Comparison with DOC Data

The survey results for PETE are compared to DOC's published PETE recovery data. For Level A, Cascadia projected the results of the sample survey to the universe of programs using statistical methods to estimate total recovery. For Level B, only the quantity reported by respondents is compared (no estimates made for non-respondents). The results of the comparison are presented in the following Table:

Cascadia Survey Results vs. DOC Data (for PETE only)
Million of Pounds
-1995-

	Cascadia	**DOC**
Level A	79.2	79.7
Level B	66.1	80.2

The comparison of the results between Cascadia and the DOC data for Level A indicate that Cascadia's method under reported by 250 tons. The results are nearly identical and indicate a high level of confidence in Cascadia's PETE recycle data. For Level B the difference between Cascadia and DOC results (7,000 tons) most likely occurs as Cascadia did not extrapolate for the survey non-respondents.

Bench Mark 2: Approximate Total RPPC Recycling Using DOC PETE Data and Reported Resin Split

For this method, the total quantity of RPPCs recovered by Cascadia is approximated based on recovered PETE as reported by DOC (40,100 tons). Total recovery is approximated by dividing PETE recovered by the percentage of PETE as a proportion of all RPPCs recovered using data obtained in the collector survey. The total quantity recycled is then approximated by applying the average yield loss factor to total recovery. This method estimates total RPPC recycling in 1995 at 78,300 tons. The estimate is nearly identical to the average tons recycled computed by Cascadia (78,200 tons) and lends further credence to the consultant's method and accuracy of the results.

Method #3: Approximate Total RPPC Recycling Using National Data

The total quantity of RPPCs recycled is approximated using APC's most recent national recycling data for non-PETE resins and applying it to California based on California's relative share of total U.S. population served by curbside programs. This method is thought to be a conservative approximation of total recycling for two reasons. First, a higher percentage of curbside programs in California collect RPPCs than in other states. Second, extrapolation based on population with access to curbside does not account for California's expansive drop-off and buy-back infrastructure. This bench mark method yields a total RPPC recycled of 79,150 tons for 1995. This benchmark is again remarkably close to the results obtained by Cascadia.

DENOMINATOR

Cascadia used waste characterization analysis (waste sorts) to determine the weight of RPPCs in the California waste stream. Cascadia's results were compared to national resin sales statistics and to Oregon and DOC data.

National Resin Sales Statistics

Virgin resin sales statistics were taken from the Society's of Plastic Industries Committee on Resin Statistics. Postconsumer resin use was determined by R.W. Beck through survey of container manufactures. The national number represents the aggregation of virgin and postconsumer resin. National virgin and postconsumer resin sales were prorated to California based on California's relative share of U.S. population. This information was also prepared for Oregon and presented in the following table.

Comparison of National Resin Sales with Waste Composition
Oregon & California
Rigid Plastic Packaging

	Waste Composition	National Resin Sales	Waste Comp ÷ National Data
Oregon (1993)	62.6 million lbs *	88.8 million lbs	70%
California (1995)	620.7 million lbs	842.6 million lbs	74%

* Oregon RPCs include a broader range of packaging types than California RPPCs.

The table indicates a difference in RPPC generation of 26 percent in California using national resin sales and waste compostition data. In Oregon the difference is greater (30 percent) in 1993.

Waste Sort Comparison

Cascadia vs. Oregon

Cascadia provided information to partially cross check the results of their waste sort against information from Oregon's waste composition study (sponsored by Oregon's Department of Environmental Quality to calculate Oregon's rigid plastic container recycling rate). The comparison is presented in the following Table:

RPPC Composition Benchmarking
California vs. Oregon

Packaging Type	Oregon (1993) lbs/capita/yr	California (1995) lbs/capita/yr
PETE	1.7	3.2
HDPE	10.6	9.6
Other	3.7	1.6
Total	**16.0**	**14.4**

Oregon's definition for rigid plastic container is less restrictive that California's (e.g., includes more containers such as polystyrene fast food and deli trays). This accounts for the larger number in Oregon's "Other" category. Also, PETE container sales (nationwide) have increased significantly in the last year. This increase in sales explains the much larger

number for PETE in California in 1995. Staff believes that, accounting for these differences, Cascadia's California RPPC waste composition study is "in line" and consistent with the results from Oregon's waste sort.

Cascadia vs. Department of Conservation

Staff also compared the result of Cascadia's waste sort for PETE soda bottles with a calculation using Department of Conservation's CRV soda bottle sales/recycle data and Board of Equalization (BOE) MSW disposal data. This comparison is presented in the following Table:

RPPCs Disposed (by weight)
Cascadia vs. DOC (1995)
(percent)

	Cascadia	DOC/BOE
PETE Soda Bottles	0.068%	0.056%

Staff used DOC reported CRV soda bottle sales data (51,404 tons) and recycle data (33,033 tons) for 1995 and Board of Equalization MSW disposal data (32,700,052 tons) for the same year. Recycle data were subtracted from soda bottle sales and the result was divided by BOE data. The results indicate (0.068% vs 0.056%) that the Cascadia waste sort approximates the DOC/BOE number which lends further evidence to a credible RPPC waste composition study.

Confidence Level

Cascadia's waste sorts were based on a statistical model and determined a result at the 90% confidence level that the percentage of RPPCs in the California waste stream was 0.71% $\pm$ 0.05% (ie, we are 90% sure the actual value is between 0.66% and 0.76%). Using data from the study, 232,170 tons were calculated as the amount of RPPCs disposed in the waste stream. This is to say, we are 90% certain the actual RPPCs disposed is between 215,820 and 248,520 tons, with 232,170 tons the most likely value. Using the low and high estimates of thew range yields a recycling rate of 26.6 percent and 23.9 percent, respectively.

COMMENTS RECEIVED FROM RECYCLING RATE ADVISORY COMMITTEE (RRAC) AND STAFF RESPONSE

To receive wide review and input, the Board established a Recycling Rate Advisory Committee comprised of representatives from the product manufacturers regulated by the Program, the American Plastics Council, environmental and waste management organizations, and plastics recyclers and reclaimers. The RRAC reviewed work in progress and advised staff on plastic recycling issues as the all-container recycling rate was being developed and determined. The RRAC is comprised of the following individuals:

Gary M. Cates
Johnson Controls, Inc.

Dan Colegrove
Grocery Manufacturers of America

Joan Edwards
J. Edwards & Associates

Tim Flanagan
Waste Management Inc.

Laurie Hansen
American Plastics Council

David Hawley
NAPCOR

Michael Harris
Dept. of Conservation

Rachel Kaldor
California Dairy Institute

Michael Kopulsky
M. Kopulsky & Assoc.

Patty Moore
Plastics Recycling Corp. of CA

Mark Murray
Californian's Against Waste

John Shedd
Talco Plastics, Inc.

In addition all materials sent to the RRAC were also sent to Catherine Beckley, Cosmetics, Toiletery and Fragrance Assn., Dennis Sabourin, Willman Inc. (representing the Association of

Postconsumer Plastics Recyclers), and Pete Price, Price Consulting (representing John Shedd).

The Board also assembled an in-house review group consisting of Dennis Meyer, Kristina Loquist, and Pat Schiavo.

The staff received comments from the RRAC on both the numerator and denominator. This attachment presents these comments and staff's response.

NUMERATOR

Yield Loss Factor

Plastic reclaimers define a yield loss as the difference between the amount of plastic purchased and the amount of plastic sold as flake or pellet. Yield loss will occur from residue, rings, caps, and moisture in the bales.

Plastic resin yield loss factors were determined by the contractor for each resin type and multiplied by the results of the survey/extrapolation methods to determine the amount of RPPCs recycled.

One RRAC member indicated the yield loss factor for "other RPPCs" reported at level A should be higher than the 12.3% reported by the contractor (the weighted average of the other RPPC resin types yield loss factor ranged from 9.7% to 14.5%). Although a specific alternate estimate was not discussed, if the yield loss for these containers was as high as 20%, the pounds of RPPCs collected at level A would be reduced by 250 tons. This reduction would reduce the recycling rate from 25.20 to 25.18 percent.

One RRAC member indicated the yield loss factor for "HDPE natural and pigmented RPPCs" at level A should be about 5 percentage points higher than the reported 9.7% for HDPE natural and 14.5% for HDPE pigmented. If the higher percentage were used, the amount of RPPCs recycled at Level A would be reduced by 2,200 tons. This reduction would reduce the recycling rate from 25.2 percent to 25.0 percent. Cascadia's information, obtained from R.W. Beck, does not support this increase in the yield loss factors. The RRAC member did not provide documentation for increasing the yield loss factor by 5 percentage points.

Survey Results

Surveys were used as a means to collect the amount of RPPC recycled from collectors (Level A), handlers/processors (Level B), and reclaimers/exporters (Level C). The method was designed to provide independent survey results for Levels A, B, and C. The results for these three levels were analyzed through a comparison with one another and with other "benchmarks". The results for Levels A, B, and C are within 7.5% of each other and

indicate a highly consistent result.

The RRAC members, in their review of the results, found Level A (collectors/handlers) (76,350 tons) likely under-estimates the amount of RPPCs recycled in the State. Up to 2,000 tons of commercial and industrial RPPCs are not collected at Level A. Rather, these RPPCs are sent directly to MRFs (Level B) or reclaimers (Level C). The RRAC did not address the issue of adjusting the result of Level A to reflect the under reporting nor discussed the procedure to adjust the results to account for the 2,000 tons. The recycling rate would increase to 25.4 percent if the additional 2,000 tons were included the numerator.

The RRAC members had no comments whether Level B (MRFs/processors) (82,000 tons) over-estimated or under-estimated the pounds of RPPCs recycled in the State. This estimate was the highest of the three levels. Staff believes this number is likely the most accurate of the three numbers calculated and believes that the number should not be adjusted. Staff's conclusion is based on the fact that Cascadia identified and contacted the universe of MRF's and processors in California. Also, staff believes that most all the material will be consolidated before it is transported to a reclaimer/exporter (little materials will be transported loose). As all processors were identified, and as all processors were contacted and adjustments made for non-respondents, the final number does not reflect any known methodological or quantitative bias.

The RRAC found Level C (reclaimers/exporters) (76,300 tons) likely under-estimates the amount of RPPCs recycled in the State. Cascadia admitted that there may be unknown exporters and reclaimers not included in the survey or, in the case of exporters, not considered in the adjustment for non-responding exporters. No estimate was given by Cascadia or the RRAC for the magnitude of the under-estimate at Level C. Additionally, the RRAC did not pursue a method to correct for the possibility that some exporters and/or reclaimers may have not been included in the final calculation.

The RRAC reached consensus to average the results of Levels A (76,350 tons), Level B (82,000 tons), and Level C (76,300 tons). The average of the three levels results is 78,200 tons of RPPCs recycled in 1995.

DENOMINATOR

Waste Sort Results

Waste characterization analysis (waste sorts) was used to determine the weight of RPPCs in the California waste stream.

RPPC Waste Composition Benchmark

One RRAC member requested that the waste sort results be cross-

checked (bench marked) against existing waste characterization data and/or against national resin sales statistics data prorated to California. Comparison of waste sort results with benchmark data is provided in Attachment 5. Comparison of waste sort results to national resin data, the problems with using national resin statistics, and staff's method to prorate national resin sales to California are presented in the Agenda Item and Attachment 4.

Staff attempted to locate local/statewide waste characterization data from the Board's Planning Division. Planning staff indicated that statewide waste characterization data is not yet available for 1995. Additionally, the Board does not have results of waste sorts conducted at the local level.

Definition of RPPC

One RRAC member suggested that the level of understanding of the definition of "RPPC by individuals responding to the RPPC recycling survey was different than the level of understanding of the people conducting the waste sorts. Thus, because of a lack of a clear understanding of the definition of RPPC, recyclers may have included non-RPPCs in the data reported to the consultant. On the other hand, the subcontractor used to perform the waste sort was well trained and more attentive to RPPCs (thus less likely to include non-RPPCs in the sort). Staff believes that the level of understanding of respondents to the survey paralleled the understanding of those conducting the waste sort. In addition, since this suggestion was made, the consultant has verified that all the MRF/processors who responded to the survey were contacted personally and that they clearly understood the definition of RPPCs.